DEFENSE PRODUCTION ACT AND THE DOMESTIC PRODUCTION OF COBALT

HEARING

BEFORE THE

COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

FIRST SESSION

TO CONSIDER SOME OF THE ISSUES INVOLVED IN THE USE OF THE DEFENSE PRODUCTION ACT AND ITS SPECIFIC AUTHORITIES TO STIMULATE DOMESTIC PRODUCTION OF COBALT

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DEFENSE PRODUCTION ACT AND THE DOMESTIC PRODUCTION OF COBALT

MONDAY, OCTOBER 26, 1981

U.S. Senate,
Committee on Banking, Housing, and Urban Affairs,
Washington, D.C.

The committee met at 9:35 a.m. in room 5302 of the Dirksen Senate Office Building, Senator Harrison Schmitt presiding.

Senator Schmitt. The hearing will come to order. And the first panel will take your seats. I see we are starting our own rock group this morning. [Laughter.]

OPENING STATEMENT OF SENATOR SCHMITT

Senator Schmitt. The purpose of today's hearing is to consider some of the issues involved in the use of the Defense Production Act and its specific authorities to stimulate domestic production of cobalt.

It is the first of a series of hearings in which the Banking Committee will examine the Defense Production Act and its relationship to the Nation's strategic stockpile and to proposals put forth by the administration for action as outlined in that stockpile.

Passage of the Defense Production Act in 1950 resulted from concerns following World War II that the President should be provided with important wartime powers to encourage domestic production of vital minerals for our defense needs. Since that time not only has the concern for potential wartime disruptions of supply continued, but as we have seen, as a result of the oil embargo of 1973 and 1974, that there can be economic emergencies created by similar nonwarlike disruptions of supply.

During the Korean war, DPA programs had a dramatic impact on the expansion of supply of a number of strategic minerals. In a few years these programs generated over $8.4 billions in minerals production with an ultimate cost of approximately $9 million. The last major nonfuel use of DPA was an $83 million loan in 1967 during the Vietnam war to facilitate the development of the Duval Sierrita Copper Mine. I should remember that, since my father was the principal economic consultant on that mine.

At the present time, the United States is faced with a very high degree of dependence on foreign producers for imports of a number of strategic minerals. For example, we are 75 percent or more dependent upon imports to meet the demands for 13 of our most critical strategic minerals which are vital to our industrial economy, not to mention our defense capacity.

This committee will be conducting hearings to consider the possibilities for use of title III of the Defense Production Act to meet some of our highest priority needs, whenever it appears that title III could be an effective and economical route to reducing our dependency on mineral imports. Presently, the United States is dependent upon foreign imports for over 90 percent of our cobalt needs which, in 1980 amounted to 17.6 million pounds of cobalt. This critical material possesses heat-resistant and high-strength qualities that are essential to the production of jet engines, electrical equipment and machine tools. A cut-off of imports could lead to severe disruptions in the production of critical defense weapons and equipment. Because of our extensive dependency on imports for this vital mineral, a stockpile goal for cobalt of 85.4 million pounds has been established. This is the amount that would be needed, according to current estimates, to meet essential defense and civilian needs in a time of war or economic emergency.

The stockpile is currently 44.5 million pounds short of this objective. At current market prices it would cost taxpayers $668.9 millions to bring our stockpile up to standard. The use of Defense Production Act authorities to establish a floor price for this material may be a far less expensive method of achieving our stockpile objective than direct purchase.

One of the primary concerns regarding cobalt is that our major source of supply is in a very unstable part of the world and one against which Soviet resource war has been increasingly directed; 74 percent of imports of this material originate in the politically unstable area of Zaire and Zambia in Africa. Zaire, which is the chief world producer of cobalt, supplies the United States with 56 percent of our cobalt needs.

Political disturbances in Zaire during 1977 and 1978 forced market prices of cobalt from $6 to $50 a pound. Since then, prices have leveled off to around $15 a pound, but this is still considerably higher than the pre-1977 prices. There is no guarantee that similar disruptions in this area will not reoccur in the near future and, in fact, I think the guarantee is specifically that they will.

The Soviet Union has a very clear plan to deny this country and the free world its essential supplies of strategic materials or to at least make their ability dependent upon the Soviet good will or Soviet guarantees.

The United States presently faces two alternatives for continued access to cobalt. We can remain dependent on insecure foreign sources or turn our attention to developing domestic production capacity, and in the long term developing alternatives to cobalt as an essential material.

Even though there has not been any substantial quantity of cobalt mined in the United States since 1972, we do have several potential deposits of this mineral that under the right conditions could be economic.

These hearings are intended to explore the possiblity of reactivating the long dormant authorities of the Defense Production Act to bring these deposits into production in order to reduce and perhaps eliminate our dependency upon foreign imports of this critical material.

Before we begin, I'd like to insert in the record a statement of the chairman of the committee, Senator Garn.

[The opening statement of Senator Garn follows as though read:]

OPENING STATEMENT OF CHAIRMAN GARN

The **Chairman**. The supply of vital strategic minerals and materials for this country is very insecure. The United States imports almost 100 percent of its requirements in manganese, cobalt, chromium, and platinum, and more than 50 percent of requirements in 23 of the 36 minerals judged essential for this Nation's industrial and military survival. What is worse is that dependency on imports for these minerals is increasing. For example, zinc imports have increased by 89 percent since 1969. Tantalum, of which we import 100 percent of our requirements, will increase in demand by 35 percent in the next 5 years. We also import 100 percent of our columbium needs, the demand for which is expected to rise by 25 percent in the next 5 years. Demand for cobalt, which this hearing is dealing with, is expected to increase by at least 3.4 percent per annum worldwide.

Without just a few of the strategic materials upon which we are import-dependent, it would be virtually impossible to produce certain types of jet engines, missile components, electrical equipment, machine tools, chemicals, stainless steel, electrical equipment, pipelines, refiners, batteries, steel, and aluminum. I do not think I need to tell the members of the committee what the effect of this situation would be on our economy or our defense capacity.

The Soviet Union is capitalizing on the U.S. vulnerability to mineral imports by discontinuing supplies of certain materials. They are also buying up materials that they formerly supplied to the world market, this, in turn, aggravates the market and drives prices up.

The obvious solution to our problem is domestic production. The new administration has taken several steps to alleviate our mineral import burden. Among these steps include reformed land policies to open up exploration of mineral deposits. Tax incentives and more rational pollution controls are also encouraging domestic exploration. These measures will help, but much more is needed to open the road to self-sufficiency in domestic production of minerals.

We are here today to consider another step which will add to our self-sufficiency of minerals. The Defense Production Act of 1950 offers several options to stimulate the production of domestic materials.

The DPA was born out of the idea that the President should have certain powers to insure adequate supplies of materials and facilities for defense purposes. Its passage, prior to the Korean war, was seen as a means of providing insurance that we would not be caught in short supply of defense production needs in time of war. In just a few years, this act provided for the doubling of production of U.S. aluminum, increased U.S. copper mine capacity by a quarter, initiated U.S. nickel mining, created the titanium industry, and quadrupled U.S. tungsten mining.

Today, the United States faces a level of vulnerability with regard to supplies of strategic minerals that in many respects exceeds that of the early 1950's. We need to begin to devise an appropriate response to this situation.

I do not think any of us want to wait until we face an emergency to find that we have not prepared ourselves for adversity either by laying away adequate stockpiles, or by having developed domestic sources for meeting emergency needs.

There has been much discussion of the minerals crisis we face today. The time has come to move from a generalized discussion of minerals dependency to the specifics. Today's hearing on cobalt is a first step in that direction.

Senator SCHMITT. This morning the first panel, and I welcome you officially now to the hearing, will consist of the Honorable Louis Giuffrida, Director of the Federal Emergency Management Agency, the Honorable Richard Donnelly, Director, Industrial Resources, Office for Research and Engineering, Department of Defense, the Honorable William Campbell, Deputy Commissioner, Federal Property Resource Service, General Services Administration, the Honorable Daniel N. Miller, Assistant Secretary on Energy and Minerals, Department of the Interior, who is accompanied by Dr. Michael Foose, Cobalt Commodity Geologist, U.S. Geological Survey, and finally, Dr. John D. Morgan, Chief Staff Officer, U.S. Bureau of Mines, Department of Interior.

Welcome, gentlemen. The fact that all of you must be here from the Government's panel indicates the complexity of dealing with strategic materials within the Federal administrative establishment as it stands today.

Mr. Giuffrida, would you proceed?

STATEMENT OF LOUIS O. GIUFFRIDA, DIRECTOR, FEDERAL EMERGENCY MANAGEMENT AGENCY, ACCOMPANIED BY PAUL KRUEGER, ASSISTANT ASSOCIATE DIRECTOR FOR RESOURCE PREPAREDNESS

Mr. GIUFFRIDA. Thank you, Mr. Chairman, for this opportunity to discuss with you the options being considered to meet our national security requirements for strategic minerals and materials, including cobalt.

Senator SCHMITT. If I could interrupt, I would like to request that you keep the summaries of your testimony to 10 minutes or less, so that there is time for questions.

Please proceed, and I apologize for the interruption.

Mr. GIUFFRIDA. All right, Senator. With me is Paul Krueger, who is the Assistant Associate Director for Resource Preparedness within FEMA. Since your comment about cutting it to 10 minutes, I will quickly scan what I'm going to say here about what FEMA's job is. We are the Government's focal point for activities associated with the management of and response to emergencies of all types. This includes the development of an industrial base capable of responding to and recovering from a wide range of possible emergency contingencies, including war. We also are involved with resources essential to the well-being and security of the Nation from the basic raw materials to the financial system, transportation, communications, energy, industrial base, and the work force.

If one of these resources is in short supply because of peacetime problems like strikes or material shortages or national security emergencies, such as mobilization, or post-attack recovery, then our primary concern is to keep the economic impact on the Nation within manageable limits.

The basic policy functions of mobilization preparedness, specifically defense production and materials stockpiling, are assigned by law to the President and have been delegated by him to the Federal Emergency Management Agency. The authorities delegated include the National Security Act, the Defense Production Act, and the Critical Materials Stock Piling Act.

The problems of the surge capacity of our industrial base and the availability of strategic materials in time of an emergency and mobilization are well known in both the executive and legislative branches. The Defense Science Board report on industrial responsiveness and the House Armed Services Committee report on the ailing defense industrial base are only two of the reports that have emphasized the deterioration of the industrial base and the problems in responding to a major defense mobilization.

CANDIDATE FOR IMMEDIATE ATTENTION

A prime candidate for immediate attention is the national defense stockpile. The Stockpiling Act provides for a stockpile "to supply the military, industrial, and essential civilian needs of the United States for national defense."

The act also requires that the "quantities of materials stockpiled should be sufficient to sustain the United States for a period of not less than 3 years in the event of a national emergency."

While the legislation supported the stockpile concept, no actions had taken place.

Senator SCHMITT. Mr. Giuffrida, if I could just interrupt. Do you think that that language is too confining and does not take into account the individual requirements for particular minerals? It is awfully general and, as you know——

Mr. GIUFFRIDA. I am going to address that for cobalt particularly in just a few moments.

Senator SCHMITT. Let me ask, do you interpret national defense as encompassing the health of the national economy as well as just military action?

Mr. GIUFFRIDA. Absolutely. National defense means to me the entire Nation, the Defense Department and civilian economy.

Based upon March 1981 prices, it would take approximately $12.5 billion to buy the amount of materials needed to fill the present national defense stockpile goals. In March 1981, President Reagan directed FEMA to begin the first purchase program for the stockpile in more than 20 years. The President said that this acquisition program is a necessary first step. Larger purchases are expected to be made as funds from sales of excess materials build up on the Stockpile Fund.

In recognition of cobalt's role in the production of weapons systems, the administration's first priority was the purchase of 5.2 million pounds of cobalt at a cost of $78 million in March of this year. This purchase will bring the inventory up to 54 percent of the desired goal. While this inventory will not meet wartime national security needs, it could protect the national defense during peacetime supply interruptions.

Currently pending before the Congress is the administration's appropriation request of $105 million for stockpile purchases for fiscal year 1982. Authorizations for disposals in the amount of approximately $2 billion have been approved. To achieve its stockpile goal this administration will promptly sell the excess materials in the manner that will not disrupt the materials markets, and when appropriated by Congress, will use the money received to acquire necessary stockpile materials. In addition, when it is in the best interests of the Nation, the administration will use barter and exchanges to acquire stockpile materials.

Stockpiling to reduce material vulnerability is a type of catastrophic insurance. Like an insurance premium, acquisition costs insure the continuation of defense and industrial production. New domestic production is an alternative to stockpiling. Since the national defense stockpile is designed to meet 3-year needs, each annual pound of new domestic production reduces stockpile requirements by 3 pounds, thereby providing a possible cost-effective alternative to stockpiling.

The President also indicated in his March 13, 1981, announcement that stockpiling was only one way to enhance our strategic posture and that the administration would be seeking ways to increase the domestic production of strategic metals and materials. Among the administration's efforts in this area are the new tax reforms and depreciation schedules designed to provide new incentives for capital investment.

Another area of significant change is the regulatory review where strong efforts are being made to reduce regulatory burdens.

The Defense Production Act provides for subsidies to stimulate domestic production of metals such as cobalt. One of the purposes of the act is "the expansion of productive capacity and supply" in the interest of national security. Title III of the Defense Production Act authorizes the use of Government loans, loan guarantees, purchase commitments, guaranteed production levels and guaranteed prices to achieve the goals.

During the 1950's and 1960's, over $8.5 billion of mineral projects were funded using these authorities at a net direct cost of $460 million. These programs doubled U.S. aluminum production, increased U.S. copper mining capacity by a quarter, initiated U.S. nickel mining, created the titanium industry, quadrupled U.S. tungsten, and greatly expanded the world columbium-tantalum mining and processing industries. At the same time, supplies of many other materials necessary to production needs and stockpiles expanded. However, not all title III projects have been unqualified successes.

For example, an attempt to prove the feasibility of mining domestic chrome deposits in Montana resulted in producing 1 million tons of low-grade ore at a cost of $35 million. This ore was sold many years later for about $7 million.

In addition, the tungsten projects of the 1950's mentioned above, resulted in Government purchases over what was required for stockpile purposes. These excess inventories are still being sold.

And finally, in 1952, the Government helped finance the rehabilitation of the Nicaro nickel mines in Cuba. This plant was subsequently nationalized by the Castro government, and the benefit of the mine lost to the United States.

This past history led the administration to an examination of the appropriateness of title III of the Defense Production Act for expanding domestic production. There would be both benefits and costs from domestic production of certain minerals. In general, the administration has a policy of relying on the market, not Federal subsidies, and has implemented the reforms already cited to improve the competitiveness of our industries.

The administration does not plan at this time to use title III, but will continue to analyze this and other alternatives. As part of this interagency effort, FEMA is reviewing the feasibility of using the Defense Production Act for cobalt.

U.S. IS LARGEST CONSUMER OF COBALT

As you know, Mr. Chairman, cobalt is one industrial material for which there is no substitute in many military and industrial applications. I think it would be useful to review the general situation with regard to cobalt. As you have pointed out, the United States is the largest cobalt consumer in the world. We use about one-fourth to one-third of world production which is about 60 million pounds per year. A high-technology metallic element like cobalt is vital to the aviation, aerospace, petroleum refining, electronics, and metals fabricating industries. The high temperature and noncorrosive high strength that cobalt imparts makes it essential in superalloys used in aircraft engines and aerospace vehicles.

Aviation applications, primarily aircraft engines and parts, represent 45 percent of the 1980 U.S. demand. As a binding agent for cementing metal particles in machine tools such as mining and drilling bits, for example, there currently are no acceptable substitutes. In critical communications applications, guidance systems and lightweight electric aircraft motors using high-performance magnets, cobalt is an essential constituent. As a catalyst in refining domestic high-sulfur crude oil, cobalt is of increasing important despite its high price.

Research efforts have been mounted in the wake of higher prices and supply disruptions to try to identify effective substitutes.

Military cobalt consumption is estimated to represent 20 to 25 percent of current peacetime demand. Wartime requirements are double peacetime consumption levels. Further, emergency defense requirements represent over half of the total U.S. emergency requirements. Two-thirds of these defense requirements are for aircraft and parts. Specific military applications, as identified by the Department of Defense, are listed in the table attached to my statement, Senator, and include everything from the Space Shuttle to armor-piercing munitions.

GEOGRAPHIC SUPPLY AREA THREATENS NATIONAL SECURITY

As the largest cobalt consumer, the United States also holds the largest share of supply vulnerability. For economic reasons there has been no domestic cobalt mine production since 1971. Further, the United States and the world supply dependence is concentrated in Africa as you pointed out. Zaire provided 55 percent of the U.S. supply, while Zambia, which is next door to Zaire, supplied 18 percent of the 1979 U.S. supply. Both those countries rely heavily on copper and cobalt exports for their foreign exchange earnings. Botswana and the Republic of South Africa each supplied 3 percent, raising the U.S. cobalt import dependence upon a single geographical area to 79 percent.

Resource ownership, as well as geographical location, is highly concentrated. One company is the source of three-fifths of the world's cobalt supply—that is in Zaire—and depends upon continued exports of copper and cobalt for its financial security.

Therefore, an important consideration is the degree to which this concentration of ownership and geographic area threaten national security.

One alternative to foreign dependency is domestic production. Increases in the price of cobalt in 1978 led companies to initiate extensive mining and refining feasibility and cost studies to develop infrastructure and to secure many of the necessary environmental permits. Plans to reopen the cobalt mines at Blackbird, Idaho, and Frederickstown, Mo., to develop a mine in the Cascade area of California, and to launch a cobalt recovery project have been considered by Noranda, Hanna, Anschutz, California Nickel & Amax mining companies.

However, there are uncertainties concerning the degree to which these initial efforts will lead to actual production. In order to proceed, these companies must foresee market conditions which lead to profitable operations. Until the supply disruptions in Zaire of 1976 and 1978, cobalt was under $5 a pound. By 1979, producer prices were $25 per pound, with spot market prices as high as $50 per pound. Today, the producer price is $17.50 per pound, and the spot market price is around $15 per pound and may be eroding further. There is little evidence to suggest prices will increase in the short term. Other witnesses on this panel, Mr. Chairman, can address the investment outlook in detail.

In conclusion, the initatives outlined earlier may help insure that our Nation has some viable industrial mobilization capability and an adequate material stockpile.

We appreciate the mutual interest in this vital issue and look forward to working closely with Congress in solving the problem of assuring the availability of strategic materials for mobilization.

Thank you.

[Complete statement of Mr. Giuffrida follows:]

STATEMENT BY LOUIS O. GIUFFRIDA, DIRECTOR, FEDERAL EMERGENCY MANAGEMENT AGENCY

Mr. Chairman, members of the committee: Thank you for this opportunity to discuss with you options being considered to meet our National security requriements for strategic materials including cobalt. I am accompanied today by Mr. Paul Krueger, who is the Assistant Associate Director for Resources Preparedness within FEMA.

The Federal Emergency Management Agency is the Government's focal point for activities associated with the management of an response to emergencies of all types. This includes the development of an industrial base capable of responding to, and recovering from, a wide range of possible emergency contingencies, including war.

There are many resources essential to the economic well-being and security of the Nation. These resources cover a wide range of needs—from basic raw materials to the financial system. They include transportation, communication, energy, food, the industrial base, and the workforce. If one of these resources is in short supply because of peacetime problems (strikes, materials shortages) or national security emergencies (mobilization, post-attack recovery), the economic impact is felt nationwide. The resource problems associated with any national defense mobilization effort are a prime concern of the Federal Emergency Management Agency, especially those issues involving the industrial base and materials availability.

The basic policy functions of mobilization preparedness, specifically defense production and materials stockpiling, are assigned by law to the President, and have been delegated by him to the Federal Emergency Management Agency. Authorities delegated include The National Security Act, The Defense Production Act, and The Strategic and Critical Materials Stock Piling Act.

The problems of the surge capacity of our industrial base and the availability of strategic materials in time of emergency and mobilization are well known in the executive and legislative branches. The Defense Science Board "*Report on Industrial Responsiveness*" and the House Armed Services Committee "Report on the Ailing Defense Industrial Base" are only two of the reports that have emphasized the deterioration of the industrial base and the problems in responding to a major defense mobilization.

Efforts of both the public and the private sector in the last year have drawn necessary attention to the problem. At this point, action is needed. I would like to review with you the administration's initiatives to lessen the dangers associated with our Nation's dependency upon foreign sources for strategic and critical materials.

A prime candidate for immediate attention was the National Defense Stockpile. The Stock Piling Act of 1979 provides for a stockpile ". . . To supply the military, industrial, and essential civilian needs of the United States for national defense." The Act also requires that the ". . . Quantities of the materials stockpiled should be sufficient to sustain the United States for a period of not less than three years in the event of a national emergency. . . ." Thus, while legislation supported the stockpile concept, no actions had taken place.

Based upon March 1981 prices, it would take approximately $12.5 billion to buy the amount of materials needed to fill the present national defense stockpile goals. The administration's reaction to this unsatisfactory situation was immediate and direct. In March, 1981, President Reagan directed FEMA to begin the first purchase program for the stockpile in more than 20 years. The President said that "This acquisition program is a necessary first step." Larger purchases are expected to be made as funds from sales of excess materials build up in the stockpile fund.

In recognition of cobalt's critical role in the production of weapon systems, the administration's first priority was the purchase of 5.2 million pounds of cobalt at a cost of $78 million in March of this year. This purchase will bring the inventory up to 54 percent of the desired goal. While this inventory will not meet wartime national security needs, it could protect the national defense if required during peacetime supply interruptions.

Currently pending before the Congress is the administration's appropriation request of $105 million for stockpile purchases for fiscal year 1982. Authorizations for disposals in the amount of approximately $2 billion have been approved. To achieve its stockpile goal, this administration will promptly sell the excess materials in a manner that will not disrupt the materials markets and, when appropriated by Congress, will use the money received to acquire necessary stockpile materials. In addition, when it is in the best interest of the Nation, the administration will use barter and exchanges to acquire stockpile materials.

Stockpiling to reduce material vulnerability is a type of catastrophic insurance. Like an insurance premium, acquisition costs insure the continuation of defense and industrial production. New domestic production is an alternative to stockpiling. Since the national defense stockpile is designed to meet 3-year needs, each annual pound of new domestic production reduces stockpile requirements by 3 pounds, thereby providing a possible cost-effective alternative to stockpiling.

The President also indicated in his March 13, 1981, announcement that stockpiling was only one way to enhance our strategic posture, and that the administration would be seeking ways to increase the domestic production of strategic metals and materials. Among the administration's efforts in this area are the new tax reforms and depreciation schedules designed to provide new incentives for capital investment. Another area of significant change is the regulatory review where strong efforts are being made to reduce regulatory burdens.

As you know, Mr. Chairman, the Defense Production Act (DPA) provides for subsidies to stimulate domestic production of metals such as cobalt. One of the purposes of the Act is ". . . the expansion of productive capacity and supply . . ." in the interest of national security. Title III of the Defense Production Act authorizes the use of Government loans, loan guarantees, purchase commitments, guaranteed production levels, and guaranteed prices to achieve the goals. During the 1950's and 1960's, over $8.5 billion of mineral projects were funded, using these authorities, at a net direct cost of $460 million.

These programs doubled U.S. aluminum production, increased U.S. copper mine capacity by a quarter, initiated U.S. nickel mining, created the titanium industry, quadrupled U.S. tungsten mining, and greatly expanded the world columbium-tantalum mining and processing industries at the same time, supplies of many other materials necessary to production needs and stockpiles expanded.

However, not all title III projects have been unqualified successes. For example, an attempt to prove the feasibility of mining domestic chrome deposits in Montana resulted in producing 1 million tons of low-grade ore at a cost of $35 million. This ore was sold many years later for about $7 million. In addition, the tungsten products of the 1950's mentioned above resulted in Government purchases over what was required for stockpile purposes. These excess inventories are still being sold. Finally, in 1952 the Government helped finance the rehabilitation of the Nicaro nickel mines in Cuba. This plant was subsequently nationalized by the Castro Government and the benefit of the mine lost to the U.S.

This past history led the administration to an examination of the appropriateness of title III of the DPA for expanding domestic production. There would be both benefits and costs from domestic production of certain minerals. In general, the administration has a policy of relying on the market, not Federal subsidies, and has implemented the reforms already cited to improve the competitiveness of our industries. The administration does not plan at this time to use title III, but will continue to analyze this and other alternatives. As part of this interagency effort, FEMA is reviewing the feasibility of using the DPA for cobalt.

As you know, Mr. Chairman, cobalt is one industrial material for which there is no substitute in many military and industrial applications. I think it would be useful to review the general situation with regard to cobalt.

The U.S., the largest cobalt consumer in the world, consumes one-fourth to one-third of world production, which is approximately 60 million pounds per annum. A high technology metallic element, cobalt is vital to the aviation, aerospace, petroleum refining, electronics and metals fabrication industries. The high temperature and noncorrosive high strength that cobalt imparts, makes it essential in superalloys used in aircraft engines and aerospace vehicles. Aviation applications, primarily aircraft engines and parts, represent 45 percent of 1980 U.S. demand. As a binding agent for cementing metal particles in machine tools, mining and drilling bits, there currently are no acceptable substitutes. In critical communications applications, guidance systems and lightweight electric aircraft motors using high-performance magnets, cobalt is an essential constitutent. As a catalyst in refining domestic high-sulfur crude oil, cobalt is of increasing importance despite its high price. Research efforts have been mounted, in the wake of higher prices and supply disruptions, to try to identify effective substitutes.

Military cobalt consumption is estimated to represent 20 to 25 percent of current peacetime demand. Wartime requirements are double peacetime consumption levels. Further, emergency defense requirements represent over half of the total U.S. emergency requirements. Two-thirds of these defense requirements are for aircraft and parts. Specific military applications, as identified by the Department of Defense, are listed in the attached table and include everything from the Space Shuttle to armor-piercing munitions.

As the largest cobalt consumer, the U.S. also holds the largest share of supply vulnerability. For economic reasons there has been no domestic cobalt mine production since 1971. Further, the U.S. and world supply dependence is concentrated in Africa. Zaire provided 55 percent of the U.S. supply, while Zambia, adjacent to Zaire, supplied 18 percent of the 1979 U.S. supply. Each of these countries relies heavily on copper and cobalt exports for foreign exchange earnings. Botswana and the Republic of South Africa each supplied 3 percent, raising the U.S. cobalt import dependence on a single geographic area to 79 percent. Resource ownership, as well as geographic location, is highly concentrated. One company is the source of three-fifths of the world's cobalt supply and depends on continued exports of copper and cobalt for its financial security. Therefore, an important consideration is the degree to which this concentration of ownership and geographic area threatens national security.

One alternative to foreign dependency is domestic production. Increases in the price of cobalt in 1978 led companies to initiate extensive mining and refining feasibility and cost studies, to develop infrastructure, and to secure many of the necessary environmental permits. Plans to reopen the cobalt mines in Blackbird, Idaho and Frederickstown, Missouri; to develop a mine in the Gasquet area of California, and to launch a cobalt recovery project have been considered by Noranda, Hanna, Anschutz, California Nickel and Amax Mining Companies.

However, there are uncertainties concerning the degree to which these initial efforts will lead to actual production. In order to proceed, these companies must foresee market conditions which lead to profitable operations. Until the supply disruptions in Zaire of 1976 and 1978, cobalt prices were under $5.00 per pound. By 1979 producer prices were $25.00 per pound with spot market prices as high as $50.00 per pound. Today the producer price is $17.50 per pound and the spot market price is around $15.00 and may be eroding further. There is little evidence to suggest prices will increase in the short term. Other witnesses testifying today can address the investment outlook in detail.

In conclusion, the initiatives outlined earlier may help ensure that our Nation has a viable industrial mobilization capability and an adequate material stockpile. We appreciate the mutual interest in this vital issue and look forward to working closely with Congress in solving the problem of assuring the availability of strategic materials for mobilization.

Mr. Krueger and I are available to answer any questions you may have.

DIRECT MILITARY APPLICATIONS OF COBALT

Military jet aircraft engines and parts (F101, TF30, TF34, F404, F100, TF39, TF33).

Military aircraft structural components, fasteners, etc. (F-18's, F-16's, F-15's, F-14's, F-4's, A10's).

Helicopter engines, fasteners, flange bolts and structural components.

Missile components, cases, hardware and springs (Trident, Poseidon, Harpoon and Dragon).

Space Shuttle and space gyros.

Military armament solenoid controls.

Military tank precision rotating components and cannon recoil springs (M-60).

Body of kinetic energy penetrator (M-735).

Projectiles and projectile parts (armor piercing).

Rocket engine cases and warheads.

Navigational equipment.

Propulsions systems (fossil and nuclear).

Missile control parts and cases.

Aircraft relays, transistors, integrated circuits and gyros.

Senator SCHMITT. Thank you, sir. We appreciate that.

Our next witness—and we will have questions for the panel after the completion of the discussions—is the Honorable Richard Donnelly, Director, Industrial Resources, Department of Defense.

STATEMENT OF RICHARD DONNELLY, DIRECTOR, INDUSTRIAL RESOURCES, OFFICE OF THE UNDER SECRETARY FOR RESEARCH AND ENGINEERING, DEPARTMENT OF DEFENSE

Mr. DONNELLY. Mr. Chairman and members of the committee, thank you for this important opportunity to discuss cobalt, which is a strategic and critical material vital to national security.

Cobalt is critical to national security, principally due to its use in high-temperature-resistant jet engines, and also for many other military and industrial applications. Cobalt is strategic to national security, because our supply vulnerability is significant due to the absence of domestic production, combined with the concentration and political instability of import sources.

Cobalt is widely recognized as a vital alloying material for high-performance aircraft. In fact, virtually all of our country's military aircraft rely on cobalt for essential combat capabilities to accomplish assigned tactical and strategic missions. This includes the cobalt requirements for combat aircraft weapons systems, particularly the tactical missiles carried for offensive and defensive weapons.

Equally important is the broad range of other military weapon systems, production of which requires cobalt. For example, all of our cruise missiles require cobalt. These include the air-launched, surface, and under-sea-launched versions.

For our surface Naval Forces, the CG-47 class guided missile cruisers and the FFG-7 class guided missile frigates require cobalt. Even the LAMPS helicopter, which provides the antisubmarine capability to the FFG-7 class, requires cobalt. Under the sea, in another arena essential to national security, the Trident fleet ballistic missile submarine and the SSN 688 class nuclear submarine require cobalt. There are other systems, some of which are sensitive, that also require cobalt.

In short, direct military application for cobalt covers the full spectrum of aerospace, surface, and under-sea warfare to achieve tactical and strategic missions essential to national security.

ESTIMATED NEED FOR COBALT DIFFICULT TO MEASURE

How much cobalt does the Department of Defense require? We estimate the current DOD requirement from the industry to manufacture weapon systems to be about 25 percent, which is in excess of 5 million pounds per year. A surge or mobilization scenario would, of course, cause a greater DOD requirement from the industry.

What is more difficult to measure is the indirect industrial support requiring cobalt, which includes the motors, magnets, electrical components, cutting tools, and extrusion dies needed to manufacture and maintain our weapon systems.

Therefore, we must recognize that the cobalt industy's existence depends on a commercial market and not on the production of military weapons systems. Unlike central economy countries, we need an existing cobalt industry serving our market economy to have a source for defense purposes.

We can best illustrate our case with the Angola-based incursion into the Shaba Province of Zaire during the spring of 1978.

On May first of that year, the major U.S. cobalt dealer implemented a 70-percent allocation on U.S. customers. That allocation lasted until July 3, 1980, a period of 2 years. To maintain ongoing defense acquisition programs, the Department of Commerce, using Defense Production Act Title I authorities, worked closely with the U.S. dealer and several intermediate producers to insure deliveries of cobalt and cobalt products to maintain weapon system production schedules during the dealer-imposed allocation.

The Defense Production Act was the only legislative authority that could effect immediate and direct results to support the national security under those circumstances. Had access to the foreign cobalt source been completely denied to us or the allocation been more severe, the situation may have been more intense than we could accept.

We have cobalt in the national defense stockpile, of course. But a drawdown under these circumstances is not desirable, since the cobalt stockpile is at 48 percent of goal. Indeed, lack of a domestic cobalt source directly contributed to national security vulnerability when the cutoff occurred.

Although title I helped Defense under those prevailing circumstances, we were painfully aware that title I would not have generated 1 pound of cobalt had a complete cutoff been instituted. Title I simply provides a means for reallocating existing supplies.

To mitigate the impact upon national security, given a future cutoff or U.S. access to cobalt being controlled by foreign interests, we support a domestic cobalt production capability. We are willing to work closely with the private sector and the Congress toward meeting this objective to improve the national security.

This concludes may prepared statement. I would be pleased to answer any questions you may have.

Senator SCHMITT. Thank you, Mr. Donnelly. We will get to the questions in a few moments.

Mr. Campbell?

STATEMENT OF WILLIAM R. CAMPBELL, JR., DEPUTY COMMISSIONER OF THE FEDERAL PROPERTY RESOURCES SERVICE, GENERAL SERVICES ADMINISTRATION

Mr. CAMPBELL. Mr. Chairman, the Administrator of GSA, Mr. Carmen, has asked me to convey his appreciation to the committee, for giving us the opportunity to testify.

I have submitted a statement for the record. I will try to shorten it.

Today we have been asked to specifically talk about the past transactions on cobalt, and GSA's current cobalt acquisition program.

COBALT ACQUISITION PROGRAM

There is no significant production of cobalt in the United States. The goals of the stockpile are coordinated by FEMA, as Mr. Giuffrida has testified, after consultation with various departments of Government and industry. GSA, in turn, is responsible for the management of the stockpile, under the Strategic and Critical Materials Stockpiling Act. We maintain the stockpile. We buy and sell in the stockpile.

Initial acquisitions of cobalt——

Senator SCHMITT. Excuse me, Mr. Campbell.

You buy and sell, but under direction, or guidance, or what?

Mr. CAMPBELL. Guidance from a general plan that is issued by FEMA, which establishes the policy.

Senator SCHMITT. Could you buy and sell if you got a whim to buy and sell?

Mr. CAMPBELL. No.

Senator SCHMITT. If FEMA says, "Buy cobalt today and sell tin tomorrow," could you do that?

Mr. CAMPBELL. Well, we are required to come to Congress to get permission to sell. And the plan that FEMA and many of the other agencies which are represented here today, is a general plan, an annual materials plan, in effect. And under that plan, we buy and sell, and we are guided by the market and a requirement not to disrupt the market.

Senator **Schmitt**. Please proceed.

Mr. **Campbell**. Initial acquisitions of cobalt for what is now the National Defense Stockpile were authorized by the Act of June 7, 1939. These acquisitions were made during the period of June 30, 1939, to June 30, 1943. Subsequent authorization for further acquisitions resulted in a total stockpile accumulation of approximately 103 million pounds by 1960. About 80 percent of this material was purchased during the 1952 to 1960 period.

Acquisitions took place by various means, including transfers of material obtained under the AID program, bartering arrangements through the Commodity Credit Corporation, and supplemental stockpile programs, and purchases from domestic mining companies under the Defense Production Act.

Under DPA, the three principal domestic cobalt suppliers from 1958 to 1960 were: The National Lead Co., Calera Mining Co., and the Freeport Nickel Co.

Disposals from the stockpile began in 1962, and by 1976 totaled 61.8 million pounds. The total value of these disposals amounted to $157 million. The current goal of 85 million pounds reflects the 44.6-million-pound deficit, as has been testified to already.

The first step in elimination of this deficit was taken on July 10, 1981, when GSA announced the signing of a contract with Sozacom, a Zairian Government-owned marketing agency for cobalt produced in Zaire, for the purchase. We purchased at that time 52 million pounds of refined cobalt metal. Deliveries are to commence in about 2 weeks. As a matter of fact, the first delivery is arriving in Baltimore this week, and will be delivered to New Haven, Ind., about the 15th of November. The total contract value for this cobalt was $78 million.

The announced acquisition of cobalt by GSA, at $15 per pound, when producer prices were $20 per pound, have made producers more competitive for current business. Producer prices have been reduced to approximately $17 per pound, with current spot prices in the area of $11 to $14 per pound.

The cobalt market is likely to remain mixed for the next few years, as world cobalt production has increased substantially since 1977 and now exceeds demand. This could have an effect on the immediate viability of any domestic production.

The use of the authorities under title III of the DPA to establish domestic production is one means of realizing the goals that have been set for materials in our national defense stockpile. However, in looking at all the alternatives, we must emphasize that the GSA role as managers of the stockpile, under section 6 of the act, does not permit stockpile action for economic reasons.

We must conduct our transactions so as "to avoid undue disruption of the usual markets of producers, processors, and consumers, of such materials and to protect the United States against avoidable loss." This requires us to seek competitive prices in both our buy and sell modes. As such, the competitive market value of a commodity must be the basis for our decision, and any variation of this position may require congressional notification.

Senator SCHMITT. Mr. Campbell, is there any conflict between what you have just said and what Mr. Giuffrida said about the economy being part of the national defense?

Mr. CAMPBELL. The economy during periods of national emergency, I believe he was referring to.

I was referring to use for economic reasons, other than for national defense purposes.

Senator SCHMITT. So, you are saying that you can't buy and sell just to protect the national economy?

Mr. CAMPBELL. The stockpile S. & C.M. Act, yes, prevents us from doing that.

Senator SCHMITT. Well, it depends upon how you determine national defense. And Mr. Giuffrida, if I understand it, would interpret it more broadly than you are interpreting it.

Does national defense only apply when you have been attacked?

Mr. CAMPBELL. No. The President has to declare this a national emergency.

Senator SCHMITT. There has to be a national emergency before you can do anything with the stockpile, for economic reasons?

Mr. CAMPBELL. The President is authorized to make releases and acquisitions for emergency reasons. But as far as the national emergency is concerned, the stockpile is basically established for that purpose. Yes.

Senator SCHMITT. Mr. Giuffrida, would you care to comment?

Mr. GIUFFRIDA. If it is determined that a purchase has to be made, even though it is not from a purely economic point—if it is a critical need, and it is expensive—we have to notify Congress, and then the purchase can be made.

NATIONAL SECURITY

My definition of "national security" is that the kind of preparedness it takes to respond to an emergency doesn't come forth on demand with the initiation of the emergency. It is something that you have to build up in advance of. And that includes having a viable industrial base with the critical skills and everything else that are associated with that. They can then respond in a manner that the Defense Department requires if, in fact, the Defense Department needs to go into a wartime posture.

Mr. CAMPBELL. Mr. Chairman, we are both saying the same thing, except it is not coming out that way.

Basically what we're talking about is not using the stockpile for use for economic purposes, in that we are stockpiling for economic reasons; if there is a shortage or something else happens, that it is in a nonemergency mode, the stockpile is not to be used for that purpose.

Other than that, it would be used for all of the levels of defense, as well as civilian needs in the time of emergency.

Senator SCHMITT. Well, let's say that—although I personally don't agree with the strategic stockpiling of a high-use commodity like petroleum—nevertheless, let's say that the petroleum stockpile was under your jurisdiction as a strategic material, and that the embargo of 1973-74 occurred, without there being a declaration of national emergency—was there at that time? I don't believe there was.

If that had been under your jurisdiction, would you say you have no authority to buy or sell in that kind of a situation, when our economy was being seriously disrupted?

Mr. Campbell. It would be up to the President to define if that is or is not an emergency.

Senator Schmitt. But without the declaration of a national emergency, you could not?

Mr. Campbell. We have released material from the stockpile within the last year and a half, for defense purposes, and it is possible. But that comes through a Presidential order, which is required by the act.

Senator Schmitt. Well, shouldn't we really read economic reasons as political reasons?

Mr. Campbell. The act itself pretty much spells out that it is not to be used for general economic purposes. In other words, we are not stockpiling in case there is a shortage, or in case—during peacetime, unless—and it is not released unless there is a need for defense purposes, specific defense purposes.

Senator Schmitt. But you would then, in your agency—and I'm sorry to belabor this point—but you would draw a distinction between defense purposes and the potential for economic disruption that would affect our national defense?

That there has to be some kind of a clear military threat before you can exercise the authorities in the act?

Mr. Campbell. Well, it is actually the President who makes that decision, on whether he's going to exercise the authority. But basically, there obviously is an area which is a grey area, where a decision has to be made by the President of the United States.

Senator Schmitt. Well, doesn't this reflect that the act is out of step with the times?

It was written with the memory of World War II, and where all defense threats were very clear and unequivocal; and now we are dealing with a resource war that has no direct troop involvement, no direct confrontation of fleets or air forces. But nevertheless, the threat to the national defense—the national security, rather—is just as clear and just as obvious.

We cannot get along without cobalt, right? And we import effectively 78 percent of our cobalt from unstable sources, namely central Africa. That is a threat to the national security.

Do you agree with that?

Do you think the administration agrees with that?

Mr. Campbell. In an emergency.

Senator Schmitt. No; without an emergency. The mere fact that we import 78 percent from an unstable region of the world, dependent upon sea lanes that may well be subject to interdiction—does that not constitute a threat?

Mr. Campbell. It does not, in the way that the act is written.

Senator Schmitt. I understand that; I'm beginning to understand that. I think I have before—but it is a threat.

Mr. Campbell. It can be a threat to our national security, yes, as oil is a threat.

Senator SCHMITT. But the act, as it is interpreted, does not recognize that threat, in terms of stockpiling?

Mr. CAMPBELL. That's correct. Nor for use for general economic purposes, balancing budgets, or, as in the case of a selloff from the stockpile in previous years. The purpose of the act, as it has been described and as it has been stated, is to be kept and retained for national emergency purposes.

Senator SCHMITT. But you are not letting me extend that national emergency to the point where we can maintain our economic vitality, under the threat of interdiction of or loss of supply?

Mr. CAMPBELL. That is correct.

Senator SCHMITT. Go ahead. I'm sorry to interrupt, but I am often very confused. And it has been discussed here before, and there even seems to be some difference of opinion on where the administration ought to be headed in this area.

You have to interpret the act, because you have the legal responsibility to maintain and support the stockpile, and to keep it secure.

Mr. CAMPBELL. That's correct.

Senator SCHMITT. I understand that. But I think it helps to illustrate the narrowness of interpretation of the act that may be required by legal interpretation, but nevertheless is out of step with the nature of the resource threat that we face today.

Mr. Giuffrida?

Mr. GIUFFRIDA. I think I would like to clarify, Mr. Chairman.

It isn't GSA that interprets the act; it is FEMA that interprets the act. Now, you can use the act to enhance national security, as we read it. You cannot use the act to control prices, for example, and that may be one of the interpretations.

Senator SCHMITT. No. I am not arguing with that, and I fully support it. Even though it has been done in the past, I recognize it is not supposed to be.

Mr. GIUFFRIDA. But, yes, you can—to answer your question specifically, we interpret it and it can be used to enhance national security.

Mr. CAMPBELL. Mr. Chairman, might I quote from the act itself? Section 3(b)(1): "The purpose of the stockpile is to serve the interest of the national defense only, and is not to be used for economic or budgetary purposes."

I think "budgetary purposes" is one of the key words in there.

Senator SCHMITT. Yes. But it has been done, right?

Mr. CAMPBELL. In the past, yes. Not since the act has been passed, though.

Senator SCHMITT. Well, that is subject to interpretation. There might even be a proposal floating around right now, relative to silver, that could be interpreted as an attempt to use the stockpile to help balance the budget. I hope that is not the correct interpretation.

Mr. GIUFFRIDA. Mr. Chairman, the Congress is a key player in this. Nobody can buy or sell unless you come in and say, "go" or "no go."

Senator SCHMITT. I understand, and that is why it is very difficult to distinguish economic from political.

Please go ahead.

Mr. CAMPBELL. I am finished with my statement, Mr. Chairman, and am prepared to answer questions.

[Complete statement follows:]

STATEMENT BY
WILLIAM R. CAMPBELL, JR.
DEPUTY COMMISSIONER OF THE
FEDERAL PROPERTY RESOURCES SERVICE
GENERAL SERVICES ADMINISTRATION

Mr. Chairman, I am William R. Campbell, Jr., Deputy Commissioner of the Federal Property Resources Service of the General Services Administration (GSA). Here with me today is Readus Long, the Director of Sales and Paul Ballou, Director of Acquisitions in the Office of Stockpile Transactions.

I am here today representing Mr. Gerald P. Carmen, Administrator of General Services, who has asked me to convey his appreciation to this Committee for inviting us to testify on the use of authorities under Title III of the Defense Production Act (DPA) to stimulate domestic production of cobalt and other commodities in short supply.

The General Services Administration is committed to carrying out its responsibilities for operating the National Defense Stockpile in a way that will help to ensure the security of the nation and the efficient functioning of the federal government.

Today, we have been asked to discuss specifically the past transaction history of cobalt and GSA's current cobalt acquisition program.

Briefly, cobalt is a hard, steel-gray, magnetic metal related chemically to iron and nickel. The material is found associated with other metals, such as copper, nickel, iron, zinc, silver, lead and gold. Cobalt is usually produced as a by-product or co-product of these other elements. It hardens and strengthens alloys to a greater extent than nickel.

There is no significant domestic production of cobalt in the U.S. Limited domestic processing of imported matte is done by Amax Nickel Inc. in Braithwaite, Louisiana and cobalt metal powder is produced in Laurinburg, North Carolina by Carolmet Inc., a wholly-owned subsidiary of Metallurgie Hoboken Overpelt.

U.S. consumption during 1980 was 15.3 million pounds. Imports of cobalt in the same year totaled 16.3 million pounds, of which the United States exported about 2.3 million pounds.

The end use demand for cobalt in the U.S. is 45 percent for superalloys (e.g., gas turbine engines), 15 percent for electric magnetic uses, 15 percent for tools, and 15 percent for catalysts. The major sources of imports of cobalt are: Zaire 42 percent; Zambia 15 percent; Norway and Japan 8 percent each; Canada and Finland 7 percent each; Belgium 6 percent and others 7 percent. The largest world mine production is in Zaire.

The goals for stockpile materials are determined by the Federal Emergency Management Agency (FEMA), after consultation with various departments of the Government and industry. GSA is responsible for the management of the stockpile under the Strategic and Critical Materials Stock Piling Act.

Initial acquisitions of cobalt for what is now the National Defense Stockpile were authorized by the Act of June 7, 1939 (Public Law 117, 76th Congress); these acquisitions were made during the period June 30, 1939 to June 30, 1943.

Subsequent authorizations for further acquisitions resulted in a total stockpile accumulation of approximately 103 million pounds by 1960; about 80 percent of this material was purchased during the 1952-1960 period.

Data in Table I show the status of stockpile cobalt metal inventories during the 1950-1981 period; this data illustrates the early build-up and later disposal activities. Acquisitions took place by various means including transfers of material obtained under the AID program, bartering arrangements through the Commodity Credit Corporation and Supplemental Stockpile programs, and purchases from domestic mining companies under the Defense Production Act (DPA). We have attached a summary (Attachment A) of DPA borrowing authority transactions for cobalt acquisitions.

Under DPA, the three principal domestic cobalt suppliers from 1958 to 1960 were the National Lead Company, Calera Mining Company, and the Freeport Nickel Company.

Disposals from the stockpile began in 1962, and by 1976 totaled 61,896,080 pounds. The total value of these disposals amounted to $156,795,000, which represented a gain of $21,504,000 over acquisitions cost. Data in Tables 2 and 3 provide information on disposal authorizations and yearly sales activity.

Table 4 shows, in chronological order, the stockpile objective/goals that were established during the 1944-1980 period. The current goal of 85.4 million pounds reflects a 44.6 million pound deficit. The first step in the elimination of this deficit was taken on July 10, 1981, when GSA announced the signing of a contract with the Societe Zairoise de Commercialisation des Minerais (SOZACOM), a Zairian Government-owned marketing agency for cobalt produced in Zaire, for the purchase of 5.2 million pounds of refined cobalt metal. Deliveries are to commence in FY 1982. The net material delivered price to GSA depots at Warren, Ohio and New Haven, Indiana is $15 per pound. The total contract value is $78,000,000.

The solicitation for the cobalt acquisition was issued in March 1981 for 1.2 to 5.2 million pounds of cobalt metal which conforms to the requirements of the National Stockpile Purchase Specification P-13-R4. Sixteen proposals were received in May 1981 from producers and traders for delivery of material from various producing countries of the world. After a complete technical and cost evaluation of the proposals, SOZACOM was selected as the most favorable proposal to the U.S. Government.

The announced acquisitions of cobalt by GSA at $15 per pound, when producer prices were $20 per pound, has made producers more competitive for current business. Producer prices have been reduced to approximately $17 per pound, with current spot prices in the area of $11 to $14 per pound.

The cobalt market is likely to remain mixed for the next few years, as world cobalt production has increased substantially since 1977, and now exceeds demand. This could have an effect on the immediate viability of any domestic production.

The use of this authorities under Title III of the DPA to establish domestic production is only one means of realizing the goals that have been set for materials in our National Defense Stockpile. However, in looking at all the alternatives, we must emphasize that the GSA role as managers of the Stockpile under Section 6 of the Strategic and Critical Materials Stock Piling Act does not permit stockpile action for economic reasons. We must conduct our transactions so as "to avoid undue disruption of the usual markets of producers, processors and consumers, of such materials and to protect the United States against avoidable loss." This requires us to seek competitive prices in both our buy and sell modes. As such, the market value of a commodity must be the basis for our decision and any variation of this position may require congressional notification.

Information about past operations under Title III of the Defense Production Act as conducted by GSA and other Government agencies has been reported to Congress in various reports. The twenty-third Annual Report of the Activities of the Joint Committee on Defense Production, which provided a comprehensive review for Fiscal Year 1973, was issued February 7, 1974. In addition, a Borrowing Authority Report was issued on June 30, 1973. This report gives a complete summary and brief description of all the DPA contracts.

Mr. Chairman, this completes my opening statement. We are prepared to answer any questions you may have.

(ATTACHMENT A)

SUMMARY OF DPA's BORROWING AUTHORITY TRANSACTIONS

As of June 30, 1973

Commodity Cobalt

(Dollars in Thousands)

DETAILS OF TRANSACTIONS

Contract Number	CONTRACTOR	GROSS TRANSACTIONS CONTRACTED						PROBABLE ULTIMATE NET COST			
		Contract Total		Completed Transactions			Incompleted Transactions	Losses Realized	Estimated Future Losses		Total PUNC
		Quantity LBS	Value	Delivered to Gov't.	"Put" Rights Not Used	Total			On Inventory On Hand	On Other Transactions	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DMP-134	Freeport Nickel Company	23,835,000	$ 47,747	617	$ 47,130	$ 47,747	$ -	$ 139	$ (15)	$ -	$ 124
DMP-III-II	Rhodesian Congo Border Power Corp.	4,027,449	7,216	5,166	2,050	7,216	-	1,053	(15)	-	1,038
D-12205	Falconbridge Nickel Mines, Ltd.	1,235,405	3,133	3,133	-	3,133	-	518	(55)	-	463
DMP-123	African Metals Corp.	13,602,147	25,428	25,428	-	25,428	-	4,959	(1)	-	4,958
D-18104	Calera Mining Company	6,501,500	14,801	14,528	273	14,801	-	2,385	(8)	-	2,377
DMP-131	National Lead Company	3,762,000	9,822	7,544	2,278	9,822	-	5,093	(20)	-	5,073
DMP-60	Falconbridge Nickel Mines, Ltd.	147,106	357	357	-	357	-	55	-	-	55
	Total GSA	33,110,607	$108,504	56,773	51,731	$108,504	-	14,202	(114)	-	14,088
	COBALT-NICKEL										
	Interior	Exploration Grant	1,034	-	-	440	586	260	-	586	846
	Grand Total		$109,538	-	-	$108,952	$ 586	$14,462	$ (114)	$ 586	$ 14,934

Losses realized do not include interest on investment in inventory, administrative expenses, or custodial costs.

(ATTACHMENT A)

COBALT - EXPLANATION OF PUMC

Market Price - $2.80 LB
$2.76 LB MS

Estimated Recoverable Value - $2.80 LB
$2.76 LB MS

DMP-III-11	Contract provides for the purchase of copper and cobalt metal at market price in sufficient quantities to service and liquidate an Export-Import Bank loan of $22,400,000. Gross transactions for cobalt cover actual purchases to date of 2,660,500 lbs. at $5,108,000, put rights not used of 1,366,949 lbs. at $2,050,000 and separately stated accessorial costs of $58,000. PUMC is estimated at $1,038,000 based on (1) actual loss of $1,053,000 on resale of 2,581,947 lbs., (2) estimated profit of $15,000 on 17,897 lbs. in inventory.
DMP-60	Contract amendment reduced the maximum purchase from 500,000 lbs. to 147,106 of cobalt metal at market, but not less than $1.80 per lb. Gross transactions cover actual purchases to date of 147,106 lbs. at $327,000 plus termination expense of $30,000. Probable ultimate net cost is estimated at $55,000 based on (1) actual loss of $55.000 which includes termination expense of $30,000 and loss of $25,000 on resale of 45,501 lbs.
D-12205	Contract provides for the purchase of 1,500,000 lbs. of cobalt metal at market prices, but not less than $1.80 per lb. Of this amount, 264,593 lbs. was cancelled by agreement dated 1-19-61. Gross transactions cover purchases to date of 1,235,405 lbs. at $3,004,000 and separately stated accessorial and other expenses of $129,000. Probable ultimate net cost is estimated at $463,000 based on (1) $518,000 costs and losses to date on resale of 1,122,140 lbs., and (2) estimated profit of $55,000 on 69,593 lbs. in inventory.
DMP-123	Contract provides for the purchase of 18,000,000 lbs. of cobalt at a maximum price of $2.00 per lb. Of this amount, the contractor failed to deliver 4,397,853 lbs. Government terminated contract on August 1, 1960. Gross transactions are based on actual purchases to date of 13,602,147 lbs. at $25,328,000 and separately stated accessorial costs of $100,000. Probable ultimate net cost is estimated at $4,958,000 based on disposal and transfer to S&CM of 13,466,558 lbs, to date and estimated profit of about $1,000 on 419 lbs. in inventory.
DMP-131	Contract D-12095 between Government and National Lead Company was entered into on October 11, 1951 providing for: (a) an advance of $7,500,000 by the Government for construction of a plant at Fredericktown, Missouri to produce cobalt, nickel and copper from iron concentrates; and (b) for Government to purchase the production at specified prices. Contract DMP-131 was then entered into (effective December 1, 1956) which provided for: (1) acquisition of the plant by the Government with cancellation of the $7,500,000 advance and lease-back of the facilities to National Lead: (2) Government obligation to expend up to $750,000 in improvements; (3) purchase of cobalt, nickel and copper by the Government at specified prices. On January 1, 1960, contract was amended to: (a) eliminate further purchases by the Government; (b) make a termination payment of $2,500,000 to National Lead to be liquidated by delivery of nickel to National Lead from Government inventory; and(3) provide for a modified lease of the plant to National Lead. See DMP-131 copper and DMP-131 nickel for Gross Transactions and PUMC for these commodities. Gross transactions for cobalt cover actual purchases of 2,885,789 lbs. at $7,520,000; expired put rights of 876,211 pounds at an estimated value of $2,278,000; separately stated accessorial cost of $24,000; and termination payment of $2.5 million. The estimated probable net cost includes: (1) actual losses on resale of 2,067,987 pounds ($2,593,000); (2) projected gains on resale at $2.80 per pound of inventory of 215,128 pounds ($20,000); and (3) a termination payment of $2.5 million.
D-18104	Contract covers the purchase of 6,501,500 pounds of nickel-cobalt alloy containing not less than 93% cobalt. Gross transactions are estimated at $14,801,000 covering purchases to date of 6,380,302 lbs. at $14,528,000; put rights expired of 147,499 lbs. at $272,000; and separately stated accessorial costs of $1,000. Probable ultimate net cost is estimated at $2,377,000 and is based on (1) loss to date of $2,385,000 on the sale of inventory of cobalt and (2) estimated gain of $8,000 based on the sale of 211,890 lbs. of cobalt and 168,576 lbs. of nickel in inventory.
DMP-134	Contract provides for purchase by the Government of cobalt at option of the contractor of up to 23,835,000 lbs. at $2.00 per lb. Gross transactions are based on the maximum Government exposure of 23.835,000 lbs. at $2.00 per lb. Probable ultimate net cost is based on loss to date of $139,000 and estimated gain of $15,000 on 19,522 lbs. in inventory.

COBALT-NICKEL EXPLANATION

Exploration Grants	The money advanced for exploration is treated as unrecoverable since the variables involved preclude any reliable estimate of possible recovery.

Table 1

Stockpile Cobalt Metal Inventories 1950 - 1980
(Pounds of Contained Cobalt Metal)

Year	Yearend Inventory
1950	14,353,445
1951	17,722,429
1952	20,455,443
1953	30,618,246
1954	42,376,170
1955	53,509,827
1956	62,118,026
1957	71,310,199
1958	87,202,000
1959	97,099,000
1960	103,235,000
1961	103,260,000
1962	103,120,000
1963	102,932,000
1964	102,199,000
1965	102,199,000
1966	101,437,512
1967	95,249,020
1968	90,295,595
1969	84,289,302
1970	78,272,666
1971	77,345,269
1972	68,175,127
1973	60,123,614
1974	50,797,947
1975	45,897,392
1976	40,693,169
1977	40,802,943
1978 to present	40,802,393

Table 2

COMPLETED DISPOSAL AUTHORIZATION

Authority	Date Authorized	Date Completed	Quantity Authorized LB	Sales	
				Quantity LB	Value (Millions $)
87HCR473	06-21-62		4,701	4,701	$ 0.000
NA	07-19-60	NA	162,120	162,120	0.021
87HCR473	06-21-62		18,000	18,000	0.024
87HCR473	06-21-60		265,000	265,000	0.416
91-317	077-10-70	8-76	38,934,393	36,328,459	108.623
DPA			75.000	78,401	0.138
DPA			17,149	17,149	0.031
DPA	08-23-66		24,992,651	25,022,250	47.540
TOTAL COMPLETED			64,469,014	61,896,080	156.795
TOTAL ACTIVE			-	-	-
CUMULATIVE TO DATE			64,469,014	61,896,080	$ 156.795

Table 3

PRIOR YEAR SALES DATA

Fiscal Year	Program	Quantity LB	Sales Value Per LB	es (Millions $)		
				Value	+ -	Profit or Loss
1966&PRIOR	SCM	449,851	$ 1.02	$ 0.460	(-)	$ 0.324
1966&PRIOR	DPA	18,149	1.76	0.032	(-)	0.097
1967	DPA	5,465,629	1.64	8.945	(-)	2.443
1968	DPA	5,045,875	1.70	8.561	(-)	2.054
1969	DPA	3,906,626	1.73	6.776	(-)	1.516
1970	DPA	9,428,775	2.11	19.856	(-)	0.538
1971	SCM	686,380	2.15	1.476	(-)	0.051
1972	SCM	4,027,308	2.15	8.703	(-)	0.240
1973	SCM	8,725,670	2.38	20.793	(+)	1.421
1973	DPA	1,030,092	2.50	2.572	(-)	0.094
1974	SCM	8,945,240	2.89	25.845	(+)	5.986
1974	DPA	71,812	2.81	0.202	(+)	0.015
1975	SCM	5,977,898	3.51	20,978	(+)	7.708
1976	SCM	7,570,099	3.80	28.768	(+)	11.962
1976	DPA	24.199	5.04	0.122	(+)	0.041
TQ76	SCM	553,841	5.17	2.866	(+)	1.637
1977	SCM	-31,364	5.13	-0.160	(+)	0.091
CUMULATIVE TOTAL		61,896,080	$ 2.53	$ 156.795	(+)	$ 21.504

Table 4

Stockpile Objectives:

November 20, 1944	11,600,000 LB
February 18, 1949	40,000,000 LB
June 29, 1950	74,000,000 LB
November 9, 1950	71,000,000 LB
October 9, 1952	71,000,000 LB
September 28, 1954	95,710,000 LB
March 15, 1955	129,000,000 LB
June 30, 1958	81,400,000 LB
November 4, 1959	19,000,000 LB
April 10, 1964	42,000,000 LB
March 27, 1969	38,200,000 LB
April 12, 1973	11,945,000 LB

Stockpile Goal:

October 1, 1976	85,415,000 LB
May 2, 1980	85,400,000 LB

Senator SCHMITT. OK. Let's go ahead with Daniel Miller.

Would you please proceed, Mr. Miller.

STATEMENT OF DANIEL N. MILLER, ASSISTANT SECRETARY, ENERGY AND MINERALS, DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY DR. MICHAEL FOOSE, U.S. GEOLOGICAL SURVEY; JOHN KUMMER, BUREAU OF MINES, DEPARTMENT OF THE INTERIOR; AND JOHN D. MORGAN, CHIEF STAFF OFFICER TO THE DIRECTOR, BUREAU OF MINES

Mr. MILLER. Thank you, Mr. Chairman.

Allow me to comment just a little bit further, along with the other representatives of the Department of Interior who are here with me today.

You know, of course, Dr. John Morgan, Chief Staff Officer to the Director of the Bureau of Mines, a man who is well known by the Congress and is the Government's, if not the Nation's, leading expert on the Defense Production Act.

And also Dr. Michael Foose of the U.S. Geological Survey, who is prepared today to discuss the state of knowledge regarding our domestic cobalt resources within the United States.

And also with us today is Mr. John Kummer of the Bureau of Mines, who is the Bureau's commodities specialist on cobalt.

First, Mr. Chairman, I want to call the committee's attention to the Bureau of Mines commodities specialists. This is a particular group of experts who are recognized internationally, throughout industry and government. An interesting feature of this recognition is, however, that foreign visitors sometimes appreciate these men and serve to remind us of just how good they really are.

Here, to appear before you this morning, I want to concentrate my comments just on cobalt if I may; but in some respects, I have to relate them to some other things.

Senator SCHMITT. I think that is important to do. And this committee, as it proceeds through this rejuvenated oversight of the DPA and stockpile-related matters, will be looking at a variety of such situations.

But please focus on cobalt, but use any analogies you think are appropriate.

Mr. MILLER. Thank you, sir.

Well, first, let's discuss, if we may, the administration's current posture on strategic and critical materials, and cobalt in particular.

In brief, we are talking about the energy and nonfuel minerals that form the industrial and defense base of the Nation, and without which the United States could not function as a modern industrial society. Obviously, this issue is of vital importance to all.

Now, I will attempt to focus on the importance of cobalt, and what the administration is doing to address the serious imbalance that has existed in recent years, between our concern for minerals and our equally important concerns about other national priorities.

In the case of about two dozen mineral materials critical to the national economy and security, the United States depends upon imports for, from half, to nearly all, of its total supplies. Cobalt is a highly important metal in this group, because we are wholly dependent upon imports for our primary supplies.

WORLD TENSIONS AND UNCERTAINTIES

In light of world tensions and uncertainties today, and with our current defense buildup, this dependence would be completely intolerable, except for the fact that for certain materials the United States maintains these strategic stockpiles that have previously been mentioned. These stockpiles cover some 93 total materials, 80 of which are of mineral origin. However, it is important to note that the current stockpile goal for cobalt is only about half fulfulled.

President Reagan recognized the need for increased stockpiles. And on March 13, 1981, he stated: "It is now widely recognized that our nation is vulnerable to sudden shortages in basic raw materials that are necessary to our defense production base."

Accordingly, he initiated the first purchase program for the national defense stockpile in over 20 years, starting with purchases this year of approximately $100 million, $78 million of which were used to purchase 5.2 million pounds of cobalt.

The Federal Emergency Management Agency (FEMA) is primarily responsible for the strategic stockpile. And because of the preponderant number of strategic and critical materials that are of mineral origin, the Bureau of Mines of the Department of the Interior works closely with FEMA in the establishment of stockpile goals and specifications, and in the formulation of FEMA's annual materials plan, which sets forth both acquisition priorities and feasible excess disposal schedules.

STOCKPILING ONLY A PARTIAL SOLUTION

However, as Congress has recognized, the stockpiling can only be a partial solution to the gamut of problems in the field of strategic minerals overall. In various major items of legislation, including the Mining and Minerals Policy Act of 1970 and the National Materials and Minerals Policy, Research and Development Act of 1980, Congress has clearly underscored the importance of domestic minerals and the need for a healthy domestic minerals industry.

But central to achieving this objective is the President's program for the economic revitalization of America, embodied in part in the Federal budget reconciliation and the tax reduction legislation recently passed by the Congress.

However, the President recognizes that these budget and tax changes are also only part of the solution, and that they will not work alone. Greater production of America's own vast supplies of natural resources is also essential.

Senator SCHMITT. Mr. Miller, if I might interrupt there, those are great words. But one thing that I don't think the administration has yet recognized is the serious erosion of the science and technology base to support those words, that has occurred over the last 10 to 15 years. And it's science and technology that is our resource base. Science, in the knowledge of where the resource's are that are available to us domestically and internationally from secure sources; and technology that defines the substitutes or alternatives to resources for which we have no domestic resource base.

And you know as well as I do that the USGS and the Bureau of Mines and other agencies, as well as private sector groups, including academia, who should be rejuvenating and continually rejuvenating that science and technology base, have been under serious budgetary attack over the last 10 years.

And this administration does not yet show a full awareness of how serious that attack has been.

Mr. MILLER. Yes, sir. Let me comment if I may.

We are very aware of the seriousness of it, and we are working on it, and we will try to do whatever we can within the budget constraints.

Senator SCHMITT. But you see, that's exactly what I'm talking about. There are three legs to the tower that supports our free society: One is our national defense capability; two is our economic capability; and three is our science and technology base. And one of those legs is seriously corroded and seriously rusted. They all have been seriously corroded and rusted in the last 10 years.

The administration has moved vigorously and correctly and promptly to deal with two of them—the defense and the economy; there is no obvious awareness yet that they understand just how seriously the third leg, science and technology leg, has been affected by the policies of the last 10 years.

Good words, but as yet no obvious awareness of that fact.

Please proceed.

Mr. MILLER. On February 26, 1981, the President established five cabinet councils. One of these is the Cabinet Council on Natural Resources and Environment, chaired by the President. Secretary Watt serves as chairman pro tem. The Council includes the Attorney General, the Secretaries of the Departments of Agriculture, Transportation, Energy, and Housing and Urban Development. The Vice President, the Counselor to the President, and the Chief of Staff serves as ex officio members. Among the working groups created by the Cabinet Council is the Strategic Minerals Working Group, chaired by my deputy, W. Perry Pendley. On it are represented all Federal departments and agencies whose programs in any way relate to minerals availability.

We have strongly supported extension of the Defense Production Act, citing in particular the need for the priorities and allocations authority provided by title I, the supply expansion authority provided by title III, and the voluntary agreement authority provided by title VII. While we supported a 5-year extension, we are pleased to note that the Congress voted a 1-year extension of the act so that it is now in effect through September 30, 1982.

The defense materials system and defense priorities system administered by the Department of Commerce under title I of the act provide instruments whereby the needs of defense programs can be given appropriate priority. The Department of the Interior, pursuant to FR 67-1313, is primarily responsible for mines, concentrating plants, refineries, and smelters, and for the minerals processed therein.

Fortunately, we have not had to use title I authority in our area of responsibility in recent years, but it is highly important, particularly in view of accelerating defense programs, to have this authority as it may be required in specific instances.

With respect to title III authority, we are presently working closely with the National Security Council, the Office of Management and Budget and FEMA to determine whether or not expansion of domestic capacity for certain minerals, including cobalt, would not be more cost effective than stockpiling per se. It is clear that the creation of every 1 ton of new domestic annual productive capacity would, under present stockpiling planning, reduce stockpile goals by 3 tons. Title III may find one way of meeting the stockpile goals and otherwise improve our readiness posture. But it has not been demonstrated that such a process is cost effective.

With respect to voluntary agreements authorized by title VII, the Department of the Interior made extensive use of that authority in the two and a half decades that it was responsible for petroleum supplies. While we have not had occasion to use voluntary agreements in recent years, there may well arise situations in which their use would promote efficiency and economy in meeting defense needs for strategic materials.

Secretary Watt is steadfast in his resolve that every feasible device shall be enlisted to help assure adequate supplies of strategic and critical minerals for the Nation's economy and national security, consistent with our goals of environmental protection and preservation. In his departmental management by objectives program, Secretary Watt stated:

> The mission of the Department of the Interior is to manage properly the trust responsibilities of the United States and to encourage and provide for the preservation, development, and management of the natural resources of the United States for the use, enjoyment, and security of its people now and in the future.

MINERAL AND ENVIRONMENTAL GOALS

Among the other Department goals that he established are increased domestic production of energy and mineral resources and the return to balanced and multiple use in Federal land management. Mr. Chairman, this Nation has reached the point in its history when new budgets, new tax policies, new regulatory philosophies and new energy, mineral and public land policies must be developed and tested. We must learn to set overall priorities, not just priorities for new land withdrawal programs or within individual environmental or economic programs. We must also learn to utilize our resources in a way that best addresses all of our competing needs and priorities. We must learn to regulate with broader concern. We must recognize that certain programs and goals, especially if taken to the extreme, will run headlong into economic, defense, and other national goals.

We must make rational choices based upon a careful weighing of all of our sometimes conflicting goals, and on where our overall priorities lie. The piecemeal system of land management, which for numerous purposes has individually set aside our public land for nonmineral use, is a particular case where the long-range resource needs of our country have been completely overlooked. We have simply lost sight of the national reliance on our public lands for a large part of our mineral needs. We have lost sight of what is really in the overall public interest.

So often we are asked to make tradeoffs in which we lose the production from a single mineral deposit because that deposit, taken by itself, would not provide a large share of our resource needs. But no one is adding up the cumulative losses caused by such decisions. Energy and strategic minerals will be found only where all the necessary geologic events have occurred in precisely the right sequence to form a deposit. Land management problems arise because the same geologic events often created scenic and environmental values that all of us want protected; thus, prohibiting mineral operations to protect surface values can often mean the loss of critically needed energy and mineral supplies.

The challenge, then, is to meet both our mineral and environmental goals at the same time. Modern laws, procedures, techniques, and prices will enable us to do this, but only if we do not unnecessarily prevent access to the lands. We can no longer afford to act as though these techniques and safeguards did not exist, as though the only way to protect important environmental values is to close the lands to exploration and production.

Secretary Watt, this administration, and I personally, are committed to meeting these challenges. That is why we feel so strongly about the need to change our public land and mineral policies, to inventory our public resources and to address our national defense and security needs much more carefully. The Secretary is steadfast in his resolve that the full resources of the Department will be brought to bear on this problem, to insure that adequate supplies of critical and strategic minerals are made available in a timely and environmentally sound manner, to provide the materials essential to the Nation's economy and national security.

That concludes my prepared statement, Mr. Chairman.

Senator SCHMITT. Thank you, Mr. Miller, and let me just say again, in reference to your underlining the words, "and environmentally sound," that it is the expansion and use of our science and technology base that is going to make that possible. And having ignored the use of science and technology to protect the environment where mineral resources must be developed, is one of the reasons why you still have a confrontation going on in this country. Neither side has recognized just what it is possible to do, and instead they've decided to fight each other, rather than try to solve the problem.

[The complete statement of Mr. Miller follows:]

Statement of Honorable Daniel N. Miller
Assistant Secretary--Energy and Minerals
Department of the Interior
before the
Committee on Banking, Finance and Urban Affairs
United States Senate

Monday, October 26, 1981

Mr. Chairman, Members of the Subcommittee, Ladies and Gentlemen:

Allow me to first introduce representatives of the Department of the Interior with me today:

Dr. John A. Morgan, Chief Staff Officer to the Director, Bureau of Mines, a man well known by the Congress, and the Government's, if not the Nation's, leading expert on the Defense Production Act. While Dr. Morgan may not have been the physician at the birth of the Act, he was in the operating room.

Dr. Michael Foose, U.S. Geological Survey, who is prepared today to discuss the state of knowledge regarding cobalt resources in the United States, an expertise which is particularly that of the United States Geological Survey.

Mr. John T. Kummer of the Bureau of Mines, the Bureau's commodity specialist on cobalt, covering all phases of worldwide production and consumption.

I want to say something in particular about the Bureau of Mines commodity specialists, a group of experts uniquely recognized throughout industry and government. An interesting feature of this recognition is how visitors of foreign governments or industries have to sometime remind us of their expertise.

It gives me great pleasure to appear before you this morning discuss the Administration's current posture in strategic and critical mineral materials, and cobalt in particular.

Briefly put, we are talking about the energy and nonfuel minerals that form the defense and industrial base of this Nation, and without which the United States could not function as a modern industrial society. Obviously, then, the issue is of vital importance to all of us.

In my prepared statement I will focus on the importance of cobalt and on what the Administration is doing to address the serious inbalance that has existed in recent years between our concern for minerals and our equally important concerns about other national priorities. I would be happy to elaborate on any of these points, answer your questions and discuss the reasons behind our renewed emphasis on minerals, public lands and strategic stockpiles when I have finished.

In the case of about two dozen mineral materials critical to the national economy and security, the United States depends upon imports for half to nearly all of its total supplies. Cobalt is a highly important metal in this group. We are wholly dependent upon imports for our primary supplies.

In light of world tensions and uncertainties today and with our current defense buildup, this dependence would be completely intolerable except for the fact that for certain materials, but by no means all, the United States maintains strategic stockpiles. These stockpiles cover 93 materials--80 of which are of mineral origin. However, the current stockpile goal for cobalt is only about half fulfilled.

President Reagan early recognized the need for increased stockpiles. He stated on March 13, 1981, "It is now widely recognized that our nation is vulnerable to sudden shortages in basic raw materials that are necessary to our defense production base." Accordingly, he initiated the first purchase program for the national defense stockpile in over 20 years, starting with purchases this year of approximately $100 million, $78 million of which were used to purchase 5.2 million pounds of cobalt.

The Federal Emergency Management Agency (FEMA) is primarily responsible for the strategic stockpile. Because the preponderant number of strategic and critical materials are of mineral origin, the Department of the Interior works closely with FEMA in the establishment of stockpile goals and specifications and in the formulation of FEMA's Annual Materials Plan, which sets forth both acquisition priorities and feasible excess disposal schedules.

However, as Congress has recognized, stockpiling can be only a partial solution to the gamut of problems in the field of strategic materials.

In the various items of legislation, including the Mining and Minerals Policy Act of 1970 and the National Materials and Minerals Policy, Research and Development Act of 1980, the Congress has clearly underscored the importance of domestic minerals and the need for a healthy domestic minerals industry. Central to achieving this objective is the President's program for the economic revitalization of America, embodied in part in the Federal budget reconciliation and the tax reduction legislation recently passed by the Congress.

However, the President recognizes that these budget and tax changes are also only part of the solution, and that they will not work alone. Greater production of America's own vast supplies of natural resources is also essential.

On February 26, 1981, he established five Cabinet Councils. One of these is the Cabinet Council on Natural Resources and Environment, chaired by the President. Secretary Watt serves as chairman pro tempore. The Council includes the Attorney General, the Secretaries of Agriculture, Transportation, Energy, and Housing and Urban Development, the Vice President, the Counsellor to the President and the Chief of Staff serve as ex officio members.

Among the working groups created by this Cabinet Council is the Strategic Minerals Working Group, chaired by my deputy W. Perry Pendley. On it are represented all Federal departments and agencies whose programs in any way relate to minerals availability.

We have strongly supported extension of the Defense Production Act, citing in particular the need for the priorities and allocations authority provided by Title I, the supply expansion authority provided by Title III, and the voluntary agreement authority provided by Title VII. While we supported a 5-year extension, we are pleased to note that the Congress voted a one-year extension of the Act, so that it is now in effect through September 30, 1982.

The Defense Materials System and the Defense Priorities System administered by the Department of Commerce under Title I of the Act provide instruments whereby the needs of defense programs can be given appropriate priority. The Department of the Interior, pursuant to FR 67-1313, is primarily responsible for mines, concentrating plants, refineries, and smelters, and for the minerals processed therein.

Fortunately, we have not had to use Title I authority in our area of responsibility in recent years. But, it is highly important, particularly in view of accelerating defense programs, to have this authority, as it may be required in specific instances.

With respect to Title III authority, we are currently working closely with the National Security Council, the Office of Management and Budget, and FEMA to determine whether or not expansion of domestic capacity for certain minerals, including cobalt, would not be more cost effective than stockpiling per se. It is clear that the creation of every one ton of new domestic annual productive capacity would, under present stockpiling planning, reduce stockpile goals by three tons. Title III may provide one way of meeting stockpile goals and otherwise improve our readiness posture but it has not been demonstrated that such a process is cost-effective.

With respect to voluntary agreements authorized by Title VII, the Department of the Interior made extensive use of that authority in the two-and-one-half decades that it was responsible for petroleum supplies. While we have not had occasion to use voluntary agreements in recent years, there may well arise situations in which the use thereof would promote efficiency and economy in meeting defense needs for strategic materials.

Secretary Watt is steadfast in his resolve that every feasible device shall be enlisted to help assure adequate supplies of strategic and critical materials for the Nation's economy and national security, consistent with our goals of environmental protection and preservation. In his Department Management by Objectives Program, Secretary Watt stated:

> "The mission of the Department of the Interior is to manage properly the trust responsibilities of the United States and to encourage and provide for the preservation, development and management of the natural resources of the United States for the use, enjoyment and security of its people, now and in the future."

Among the Departmental goals that he established are increased domestic production of energy and mineral resources and the return of the balance and multiple use to Federal land management.

Mr. Chairman, this Nation has reached a point in its history when new budgets, new tax policies, new regulatory philosophies and new energy, mineral and public land policies must be developed and tested. We must learn to set overall priorities--not just priorities for new land withdrawal programs or within individual environmental or economic programs. We must also learn to utilize our resources in a way that best addresses all our competing needs and priorities.

We must learn to regulate in the big picture. We must recognize that certain programs and goals, especially if taken to the extreme, will run headlong into economic, defense and other national goals. We must make rational choices, based on a careful weighing of all our sometimes conflicting goals and on where our overall priorities lie.

The piece-meal system of land management, which for numerous purposes has individually set aside our public land for nonmineral use, is a particular case where the long-range resource needs of our country have been completely overlooked. We have simply lost sight of the national reliance on our public lands for a large part of our mineral needs. We have simply lost sight of what is really in the overall public interest.

So often we are asked to make trade-offs in which we lose the production from a single mineral deposit because that deposit, taken by itself, would not provide a large share of our resource needs. But, no one is adding up the cumulative loss caused by such decisions.

Energy and strategic minerals will be found only where all the necessary geologic events occurred in precisely the right sequence to form a deposit. Land management problems arise because these same geologic events often created scenic and environmental values that all of us want protected. Thus, prohibiting mineral operations to protect surface values can often mean the loss of critically needed energy and mineral supplies.

The challenge, then, is to meet both our mineral and environmental goals at the same time. Modern laws, procedures, techniques and prices will enable us to do this--but only if we do not unnecessarily prevent access to the lands. We can no longer afford to act as though these techniques and safeguards did not exist; as though the only way to protect important environmental values is to close the lands to exploration and production.

Secretary Watt, this Administration, and I personally are committed to meeting these challenges. That is why we feel so strongly about the need to change our public land and mineral policies, to inventory our public resources and to address our national defense and security needs much more carefully. The Secretary is steadfast in his resolve that the full resources of the Department will be brought to bear on this problem, to ensure that adequate supplies of critical and strategic minerals are made available in a timely and environmentally sound manner, to provide the materials essential to the Nation's economy and national security.

Mr. Chairman, that concludes my prepared testimony. I and my associates would be happy to respond to any questions you might have, especially on the public land and exploration aspects of this vital issue.

Senator SCHMITT. And now, Dr. Foose.

STATEMENT OF MICHAEL R. FOOSE, COBALT COMMODITY GEOLOGIST, U.S. GEOLOGICAL SURVEY

Dr. FOOSE. Mr. Chairman, my name is Dr. Michael P. Foose, and I am pleased to appear before this committee as the U.S. Geological Survey's cobalt commodity geologist. I would like to discuss the quantity, quality, and location and accessibility of domestic cobalt deposits.

Senator SCHMITT. I hope you will summarize your testimony. The entire testimony will be included in the record.

Dr. FOOSE. Yes. I would like to compare the domestic deposits to deposits in other parts of the world. I would also like to comment on the potential for finding additional domestic cobalt resources. I have appended to this summary statement a more technical report that will discuss some of these points in more detail.

Unlike most critical commodities, cobalt is almost never mined as a principal product, but instead it is usually extracted as a byproduct of deposits mined principally for nickel and copper, and less often from deposits mined for silver, iron, lead, zinc, uranium, and manganese. The byproduct extraction of cobalt is important primarily because it means the cobalt availability is intimately linked to the mining of nickel and copper.

COBALT GEOLOGIC SETTINGS

Cobalt occurs in a wide variety of geologic settings, but currently only three types of deposits are important in producing cobalt. These are: one, stratabound copper deposits, deposits that lie comfortably within rock strata, in sedimentary rocks located in Zaire and Zambia; two, nickeliferous laterite deposits, deposits occurring in residual soils that are rich in nickel and iron, that are found in many countries which have tropical climates; and three, copper and nickel magmatic sulfides, sulfide-rich concentrations which occur in igneous rocks, found in mafic and ultramafic rocks, rocks rich in iron and magnesium and poor in silicon. These three deposit types currently account for the vast majority of the world's land-based cobalt resources, which are estimated in excess of 7.5 million tons of cobalt metal.

A further breakdown of this figure shows that about 75 percent of this cobalt is in nickel laterite deposits, while the remaining amount is divided nearly equally between stratabound "Zaire-Zambia" type copper and magmatic sulfide deposits. This data is important because it shows that, although the deposits in Zaire and Zambia currently dominate world cobalt production, nickel laterites will, in the distant future, provide an important and diversified source of cobalt.

In addition to these land-based resources, there are large amounts of cobalt present in deep-sea manganese nodules. These are nodules found in the deep ocean floor. Estimates place this resource in excess of 100 million tons of cobalt, but development of this resource has been hampered by high cost, technologic difficulties, and of course, lack of international agreements on the laws of the sea.

U.S. COBALT RESOURCES

The U.S. cobalt resources are estimated at about 1.4 million tons. I've shown a map showing the distribution of these resources. This map is useful in making two major points. First, although the resources of cobalt in the United States are quite large, most occur in widely scattered deposits. These are shown mostly by the red dots, and it is clear that they occur in a wide variety of different geographic settings and also in a number of varied geologic settings. Most of these occurrences are small. They are not now economic, and most will probably never be economically usable.

The second major point here is that the United States does have four major resources of cobalt which can, in the near future, provide us with a source of domestic cobalt. These are, first, the Blackbird deposit located in Idaho. This is a deposit that is estimated to contain in excess of 6 million tons of ore, at grades about 1.3 percent copper and 0.5 percent cobalt. Thus, in size and grade, this deposit is similar to some of the deposits in Zaire and Zambia that are also today producing cobalt and copper.

The second major resource occurs in southeast Missouri, what we call the Missouri lead district. These ores, in addition to containing lead, have minor amounts of cobalt, between about 0.01 and 0.03 percent cobalt. This district, as a whole, is estimated to have in excess of 60,000 tons of cobalt metal. Now, to my knowledge, deposits of this type are not mined elsewhere in the world to produce cobalt. These deposits are currently undergoing development and may, in the near future, be a domestic source of cobalt.

The third major resource occurs in northern California and southern Oregon. These deposits are nickel laterite deposits which formed about 15 million years ago during a period of tropical weather. The result of this tropical weathering event was a district which is estimated to contain about 43,000 tons of cobalt metal. One of the more attractive deposits occurs right here in northern California on Gasque Mountain. It is currently being explored and developed, and is estimated to have between 40 and 90 billion tons of ore grading at about 0.1 percent cobalt. In size, therefore, this deposit is similar to producing laterites deposits elsewhere in the world.

The fourth major domestic resource is located here in northeastern Minnesota. It is our big one. It is called the Duluth complex. It is an igneous complex and the cobalt is with copper and nickel in magmatic sulfides that are concentrated near the base of the intrusion. The intrusion is poorly exposed and relatively poorly known, but the resource is known to be large. Probably ores are in excess of 1 billion tons. The grade, however, is quite low. Cobalt grades at about 0.04 percent. More importantly, though, the combined nickel and copper grades are probably less than about 0.7 percent. Thus, the deposit is extremely large, but the low grades of the ores have prevented it from being mined.

The future development of these resources, as well as the development of as yet unidentified deposits, will hinge on a large number of factors. For the identified deposits, extraction of cobalt will largely be determined by, first, the price of nickel and/or copper; second, the price of cobalt; and third, the existence of an economical extraction process.

However, the development of as yet unrecognized deposits is a much more complicated process. In addition to the favorable economic and metallurgical conditions required for identified deposits, an environment conducive to exploration and development must exist. Establishment of this environment begins with the acquisition of geologic data which may then be integrated in developing geologic models that can be used in defining exploration targets. Once target areas have been defined, effective exploration further requires the existence of adequate techniques that can detect mineralization and, ultimately, the availability of land on which new geologic ideas and exploration techniques can be tested and in which new deposits can be found.

It must be emphasized that the development of geologic models and new exploration techniques evolves with the acquisition of knowledge and new technologies. The application of new ideas to find deposits in areas that previously had been extensively explored is common in the history of mineral exploration and clearly shows that a one-time evaluation of an area is incapable of fully assessing its potential for mineral deposits.

The potential for finding additional domestic cobalt-bearing deposits is very good. Favorable new target areas can be defined by developing models based on the important "Zaire-Zambia" and "Norilsk" type of deposits. I think also targets might be found by looking for the important magmatic sulfide type of deposits that are known to occur in the Norilsk district of the Soviet Union. Geologic settings which I believe are favorable for these two types of deposits exist in a number of areas, including parts of Idaho, Montana, Washington, Minnesota, Michigan, New Mexico, and along parts of the eastern seaboard.

Thank you very much.

[Complete statement follows:]

Testimony of Dr. Michael P. Foose

U.S. Geological Survey

before the

Senate Committee on Banking,

Housing, and Urban Affairs

October 26, 1981

Mr. Chairman, my name is Dr. Michael P. Foose. I am pleased to appear before this Committee as the U.S. Geological Survey's cobalt commodity geologist to discuss the quantity, quality, location, and accessibilityof domestic cobalt deposits, and to compare these deposits to deposits in other parts of the world. Appended to this summary statement is a more technical report that describes in more detail the geology of cobalt deposits and implications regarding future development of domestic cobalt resources.

Unlike most critical commodities, cobalt is almost never mined as a principal product. Instead, it is usually extracted as a by-product of deposits mined principally for nickel and copper, and less often, for silver, iron, lead, zinc, uranium, and manganese. The by-product extraction of cobalt is important primarily because it means that cobalt availability is intimately linked to the mining of nickel and copper.

Cobalt occurs in a wide variety of geologic settings, but currently only three types of deposits are important in producing cobalt. These are: 1) stratabound copper deposits (deposits that lie conformably within rock strata) in sedimentary rocks located in Zaire and Zambia, 2) nickeliferous laterite deposits (deposits occurring in residual soils that are rich in nickel and iron) that are found in many countries which have tropical climates, and 3) copper and nickel magmatic sulfides (sulfide-rich concentrations which occur in igneous rocks) found in mafic and ultramafic rocks (rocks rich in iron and magnesium and poor in silicon). These three deposit types currently account for the vast majority of the world's land based cobalt resources, which are estimated in excess of 7.5 million tons of cobalt metal.

A further break down of this figure shows that about 75% of this cobalt is in nickel laterite deposits, while the remaining amount is divided nearly equally between stratabound "Zaire-Zambia"-type copper and magmatic sulfide deposits. This data is important because it shows that, although the deposits in Zaire and Zambia currently dominate world cobalt production, nickel laterites will, in the distant future, provide an important and diversified source of cobalt.

The United States' cobalt resources are estimated at about 1,400,000 tons. Most of this is in small deposits and occurrences which arel not now and may never be economically usable. However, four types of deposits will be important for near term domestic production. First, the Blackbird deposit in Idaho, which is estimated to contain at least 6 million tons of ore grading 1.31% Cu and 0.55% Co. In size and grade, this deposit is thus quite similar to some deposits now being mined in Zaire and Zambia and it is currently undergoing active development. Second, lead ores in "Mississippi-valley" type deposits of southeastern Missouri, are estimated to contain between 0.1-0.31 % cobalt and possibly to have as much as 60,000 tons of cobalt metal. Deposits of this type are not mined elsewhere in the world for cobalt, but some areas in southeast Missouri are currently under active development. Third, nickel laterites located in northern California and southern Oregon are estimated to have up to 43,000 tons of cobalt. A deposit now being developed near Gasque, California is estimated to have between 40 and 90 million tons of ore with 0.8% nickel and 0.1% cobalt, which makes it similar in size but slightly lower in grade than most of the world's producing laterites. Fourth, in northeastern Minnesota a large igneous intrusion hosts large tonnages of low grade copper-nickel sulfides which have small amounts (about .04%) of cobalt. The tremendous size of this deposit, over 100,000,000 tons of ore, makes it the nation's largest cobalt resource, but the low copper and nickel grades of these deposits has prevented mining of the ore.

In addition to these land based resources, large amounts of cobalt are present in deep sea manganese nodules. Estimates place the total amount of cobalt in the nodules at 100 million tons. Development of this resource, however, must await the resolution of technological problems and international legal agreements.

It is thus apparent that most of the world's land-based cobalt is either in nickel laterites, magmatic sulfides, or stratabound copper deposits. The U.S. has well known examples of the first two of these three types in deposits located in California, Oregon, Minnesota, Montana, and Alaska. These domestic deposits, however, are lower in grade than most deposits that are now being mined. The United States, however, does not have any examples that are clearly of the important "Zaire-Zambia"-type deposits.

The future development of the identified domestic deposits and the finding of as yet unidentified domestic deposits will depend on several factors. For identified deposits, extraction of cobalt will largely be determined by a) price of nickel and/or copper, b) the price of cobalt, and c) the existence of an economical extraction process.

However, the development of as yet unrecognized deposits is a much more complicated process. In addition to the favorable economic and metallurgical conditions required for identified deposits, an environment conducive to exploration and development must exist. Establishment of this environment begins with the acquisition of geologic data which may then be integrated in developing geologic models that can be used in defining exploration targets. Once target areas have been defined, effective exploration further requires the existence of adequate techniques that can detect mineralization, and, ultimately, the availability of land on which new geologic ideas and exploration techniques can be tested and in which new deposits can be found.

It must be emphasized that the development of geologic models and new exploration techniques evolves with the acquisition of knowledge and new technologies. The application of new ideas to find deposits in areas that previously had been extensively explored is common in the history of mineral exploration and clearly shows that a one-time evaluation of an area is incapable of fully assessing its potential for mineral deposits.

The potential for finding additional domestic cobalt-bearing deposits is very good. Favorable new target areas can be defined by developing models based on the important "Zaire-Zambia" and "Norilsk"-type of deposits. Geologic settings favorable for these deposits exist in a number of regions including Idaho, Montana, Washington, Minnesota, Michigan, New Mexico and the Eastern seaboard.

Appendix I

Geology of important cobalt-bearing deposits and implications regarding future development of domestic cobalt resources

by

Dr. Michael P. Foose
U.S. Geological Survey

Cobalt is a critical element used in making many important steels and alloys. However, unlike most important commodities, it is almost never extracted as the principal product of a mining operation. Instead it is usually obtained as a by-product from ores that are mined principally for nickel or copper, and less often for silver, iron, chromium, lead, zinc, uranium, and manganese.

The by-product extraction of cobalt has four important implications. First, minor amounts of cobalt are present in a wide variety of deposit types from which at least some cobalt extraction is theoretically possible. Second, in most cases the feasibility of mining a cobalt-bearing deposit will be largely determined by the economics of the principal metal contained in the deposit. Third, cobalt supply will be fairly insensitive to changes in cobalt price, as availability will be dictated primarily by the price of the metals with which cobalt occurs (mostly nickel and copper). Fourth, the relatively inelastic response of cobalt supply to cobalt price may be significantly changed by developing metallurgical procedures which either make possible or improve the recovery of cobalt from existing ores.

The following analysis of both foreign and domestic cobalt deposits and resources leads to three important conclusions. First, that although deposits located in Zaire and Zambia currently dominate world production of cobalt, they represent only about 15% of the world's cobalt resources.

In contrast, nickel laterites that are located mostly in tropical parts of the world, have about 75% of the world's cobalt resources and in the distant future, will provide a number of diverse sources of cobalt. Second, domestic cobalt resources are quite large. However, only deposits located in Idaho, Missouri, Oregon-California, and Minnesota are capable of providing cobalt in the near future. Third, excellent potential exists for finding as yet undiscovered domestic deposits similar to the important deposits in Zaire and the U.S.S.R. Favorable target areas for Zaire-Zambia deposits exist in depositional basins located in the Idaho-Montana-Washington area and in Georgia. Favorable areas for the deposit types found in Norilsk, USSR are in the Lake Superior region of Minnesota. However, the finding of these undiscovered deposits will depend on developing adequate geologic models, and exploration techniques, and the availability of lands for mineral exploration. Fourth, vast cobalt resources are present in the deep ocean, ut are as yet unavailable due to technologic and international legal difficulties and extremely high costs.

Processes of cobalt concentration: The concentration of cobalt in the outer part of the earth's crust is between 18-25 ppm, making it the 36th most abundant element. Cobalt, however, is not uniformly distributed among all rocks. Because its ionic radius is similar to those of iron and magnesium, cobalt substitutes for those two elements in rocks. The result is that igneous ultramafic rocks (rocks rich in iron and magnesium and poor in silica) are also rich in cobalt (75-270 ppm), while granitic or silica-rich rocks are cobalt poor (5-15 ppm). The presence of cobalt in sedimentary and metamorphic rocks varies widely but, with the important exception of deep ocean clays and nodules, is usually less than 50 ppm. Deep ocean deposits, however, may contain economically important concentrations of cobalt.

Three important processes further act to concentrate cobalt. These are the partitioning of cobalt into sulfide minerals within mafic and ultramafic magmatic rocks, the concentration of cobalt with manganese in oxidizing or weathering environments, and the mobilization of cobalt in hot aqueous fluids. The types of deposits resulting from these processes and important domestic and non-domestic examples are described below. The major mineral species which contain relatively large amounts of cobalt and which have been mined for cobalt are given in Table 1.

Table 1.--Cobalt minerals

Mineral	Percent cobalt
Linnaeite, Co_3S_4	58.0 (theoretical)
Siegenite, $(Co,Ni)_3S_4$	20.4-26.0
Carrollite, $(CO_2Cu)S_4$	35.2-36.0
Cobaltite, $(Co,Fe)AsS$	26.0-32.4
Safflorite, $(CO,Fe)As_2$	13.0-18.6
Glaucodot, $(Co,Fe)AsS$	12.0-31.6
Skutterudite, $(Co,Fe)As_3$	10.9-20.9
Heterogenite, $CoO(OH)$	64.1 (theoretical)
"Asbolite," (Manganese oxides + Co)	.5-5.0
Erythrite, $(Co,Ni)_3(AsO_4)_2 \cdot 8H_2O$	18.7-26.3
Gersdorffite, $(Ni,Co)AsS$	(low)
Pyrrhotite, $(Fe,Ni,Co)_{x-1}S_x$	1.00 (maximum)
Pentlandite, $(Fe,Ni,Co)_9S_8$	1.50 (typically)
Pyrite, $(Fe,Ni,Co)S_2$	13.00 (maximum)
Sphalerite, $Zn(Co)S$	.30 (maximum)
Arsenopyrite, $Fe(Co)AsS$	.38 (maximum)
Manganese oxide minerals	.10-1.00 (or more)

Types of cobalt-bearing deposits:

1. Stratabound copper deposits--most cobalt production today is from stratabound copper deposits located in Zaire and Zambia. These deposits currently produce over 60% of the world's cobalt and supply the United States with between 60-70% of its cobalt. These deposits occur within sequences of fine- to medium-grained clastic rocks (shales and sandstones) and carbonates that are part of a Proterozoic depositional sequence that extends over 400 km in strike length. The

deposits are interpreted to have precipitated from ground water or marine solutions close to shorelines of an ancient sea. Deposits typically have cobalt grades of 0.1-0.5%, but can reach 1-2%. Copper grade is mostly between 4-6%, but locally is greater than 7%.

The deposits in Zaire and Zambia are the only known examples of this important deposit type. Geologic settings similar to those in central Africa occur in some of the Belt-series rocks in Idaho, Montana, and Washington and in the Ocoee-series rocks in Georgia. These areas may thus contain as yet unrecognized deposits of the Zaire-Zambia type.

2. Laterite deposits--Ultramafic igneous rocks are often exposed by faulting near edges of crustal plates. Where tropical climates are present, the ultramafic rocks undergo chemical weathering by a complex series of hydrolysis reactions and a chemically zoned soil profile develops. Iron in solution readily oxidizes and precipitates to form a hard crust at the top of the profile. Silicon and magnesium are more mobile and concentrate near bedrock at the base of the soil. Depending on the chemistry of the groundwaters, nickel may concentrate with iron in the upper parts of the soil and make limonitic ore or be with the silica and magnesium at the base of the profile and form silicate ore. Cobalt in contrast is found principally in the upper iron-rich parts of the profile, where it is mostly associated with manganese. Nickel in the limonitic ores is usually between 0.8-1.1% and cobalt is about .1%. In silicate ores, nickel concentration is generally greater than 1.4% and may exceed 5%; cobalt, however, is only about 0.03% which is also the approximate value in the unaltered bedrock. Thus, cobalt extraction from silicate nickel ore is not feasible.

Important nickel laterite deposits are located in New Caledonia, Indonesia, the Philippines, Dominican Republic, Guatemala, Venezuela, Columbia, Cuba, and Australia. Tropical weathering which occurred about 15 million years ago also formed lateritic soils in southern Oregon and northern California. Nickel is currently extracted from one of these deposits (Riddle, Ore.) but no cobalt is produced. Potential for future cobalt production from some of these deposits does exist.

3. Magmatic sulfides--When sufficient sulfur is present in crystallizing mafic and ultramafic magmas, immiscible sulfide droplets separate and, like raindrops, fall to and accumulate at the bottom of the magma chamber. Iron, nickel, copper, cobalt, and platinum group elements are partitioned from the silicate melt into these sulfides. Thus concentrations of these sulfides are often economically important. Deposit mineralogy is mostly pyrrhotite, pentlandite, and chalcopyrite. Metal contents of deposits vary widely depending on the chemistry of the magma and the environment of ore deposition. Typically, nickel and copper concentration is between 0.5 to 3%, and cobalt is .01 to .2%. Important nickel-copper deposits are in the Sudbury complex, Ontario, the Abitibi and Thompson districts of Canada, the Norilsk area, U.S.S.R., western Australia, and the Bushveld complex of South Africa. Important domestic deposits are in the Duluth complex, Minn., the Stillwater complex, Mont., and the Brady Glacier deposit, Alaska.

4. Hydrothermal deposits--Hot aqueous solutions are important in forming a wide variety of diverse types of cobalt-bearing deposits. These heated solutions may result from a wide variety of geologic processes that range from intrusion of igneous rocks, compaction and diagenesis of sediments within a depositional basin, or serpentinization of ultramafic rocks. Three main types of cobalt-bearing deposits result from these

diverse processes. a) Hydrothermal solutions associated with either mafic or silicic intrusions form vein deposits that are usually rich in copper, silver, gold, and occasionally some cobalt. Examples are the silver-arsenide deposits at Cobalt, Ontario (up to 10% cobalt) and the silver, lead, zinc deposits at the Bawdwin mine, Burma (.5% cobalt). Domestic examples occur in the Goodspring district New Mexico, and at Great Hill, near Bridgeport, Connecticut. b) Hydrothermal solutions associated with compacting sedimentary basins leach metals from deep basin sediments and deposit them near basin margins. Deposits mostly contain lead, zinc, and some copper, but some have high concentrations of cobalt and nickel. Deposits located in southeastern Missouri are of this type and represent an important potential producer of domestic cobalt. c) Hydrothermal solutions which alter large blocks of ultramafic rocks locally make vein concentrations of cobalt-bearing sulfides and arsenides. Deposits of this type are rare and mostly small. However, the deposit at Bou Azzer, Morocco is of this type and represents the only deposit in the world that is mined principally for its cobalt. Domestic examples of this type of mineralization are known near the Illinois River in Oregon and in Snohomish County, Washington.

5. The Blackbird deposit is a cobalt-bearing sulfide deposit that represents one of the nation's major identified concentrations of cobalt. The deposit does not represent a separate class of deposit, so much as it is a deposit which escapes easy classification. Some have interpreted it to be a hydrothermal deposit, while more recent work shows it to be, at least, in part, stratiform. Certainly, the deposit has experienced a long and complex history and it is probable that more than one process acted to localize ore.

The deposit is within highly deformed and metamorphosed argillaceous quartzites, phyllites, and quartz-mica schists. Mineralization within these rocks is principally cobaltite and chalcopyrite mixed with pyrrhotite and pyrite. Other minerals are cobaltian pyrite, safflorite, and some gold. The mineralization mostly is conformable within the rock unit over a distance of at least 2 km, although locally it occurs in veins which cross cut layering. Ore averages about 1.3% Cu, and .55% Co.

6. A variety of additional types of deposits are known to also have cobalt. Four are of importance. In the first type, diabasic sills near Lebanon and Berks Counties, Pa. have formed iron deposits at contacts with country rock. Pyrites within these deposits have as much as 1.4% cobalt and were a source of domestic cobalt until 1971. The deposits are now inactive. In the second type, stratabound sulfide deposits that are probably of volcano-sedimentary origin are mined principally for sulfur, iron, copper, and zinc. Pyrites in some deposits contain up to 0.5% cobalt. The best known domestic deposit of this type is near Ducktown, Tenn. In the third type, cobalt occurs in surficial manganese deposits. Examples are in the southeastern U.S. In the fourth type, nodules on the deep ocean floor form from the slow precipitation of metals at the water-sediment interface. Nodules typically contain 25% Mn, 1.5% Ni, 1.5% Cu, and 0.2% Co. Locally extensive blankets of residual deposits occur in the north-central Pacific between 0° and 20° N latitude. The deep sea deposits represent a major and very significant potential source of cobalt but their development must await technologic advances and the resolution of international agreements on their development.

World cobalt resources: The identified and inferred land based resources of cobalt are estimated to be in excess of 7.5 million tons of metal and are shown in table 2. This is a very large figure compared with the projected near-term annual world consumption of between 45,000-70,000 tons of cobalt. However, it is important to stress that this resource figure largely includes low grade materials that will not be economically useable in the near future and, further, will be developed only if the price of the principal metal in these deposits (usually nickel and copper) is sufficiently high. World reserve-base figures which more closely estimate the material useable in the near future are estimated by the U.S. Geological Survey and Bureau of Mines at about 3.5 million tons of ore with between .01-.8% cobalt.

In addition to these land based resources, large tonnages estimated to contain about 100 million tons of cobalt are in deep sea manganese nodules.

Table 2 shows that the majority of world cobalt resources (about 75%) are in nickel laterites. The remaining resources are divided nearly

Table 2.--Resources Estimate

Country	Resources cobalt metal (x1000 tons)	Grade of deposit	Type of deposits
Philippines	2,000	.03-.12	laterite
Cuba	1,100	.03-.12	"
New Caledonia	950	.03-.05	"
Indonesia	850	.03-.15	"
Zaire	700	.1-.45	stratabound copper
Zambia	350	.09-.4	"
U.S.S.R.	350	.03-.1	laterite and magmatic
Australia	300	.08-.5	"
Canada	250	.03-.11	magmatic
Others	1,200		
TOTAL	7,750		

equally between the stratabound deposits in Zaire and Zambia and those hosted in magmatic sulfide deposits. Therefore, it is reasonable to expect increased cobalt production from a wide variety of nickel producing countries as more nickel laterites are mined in the distant future. In the immediate future, however, the deposits in Zaire and Zambia will continue to provide the United States with most of its cobalt followed by the magmatic sulfide deposits in Canada, and the laterites and sulfide deposits in Australia.

Domestic resources: Table 3 lists estimated domestic resources. It must again be emphasized that most of the resources in this table are not now and may never be economically useable. This listing, however, does represent an approximation of our presently known national cobalt-endowment.

Of the deposits listed, only four are considered capable of producing cobalt in the near future. These deposits are 1) the Blackbird deposit, Idaho, 2) lead-rich ores located near Fredericktown, Missouri, 3) nickeliferous laterites located in northern Californian and southern Oregon, and 4) copper-nickel sulfides in the Duluth complex, Minn.

The Blackbird deposit in Idaho represents the nation's most likely source of domestic cobalt in the near future. The deposit is estimated to contain in excess of 6 million tons of ore containing 0.55% cobalt and 1.31% copper. This represents over 35,000 tons of cobalt and 85,000 tons of copper. The deposit thus compares favorably in size and in grade with many deposits currently producing cobalt. Individual deposits in Zaire, for example, typically contain between 30 and 100 million tons of ore that has 3-5% copper and 0.3-0.5% cobalt.

Cobalt and nickel occur within the predominantly lead-bearing ores located in southeast Missouri. Attempts at profitable recovery have centered around the Mine la Motte-Fredericktown subdistrict. During 1944 to 1961, nickel-cobalt concentrates were produced as a result of government subsidies, the loss of which in 1959 caused attempts at recovery to cease. Mining and milling procedures currently preclude recovery of cobalt although the Anschutz Mining Company has recently begun a program to recover cobalt from currently inactive mines. Cobalt content of ores is mostly between .01-.03% and the district may contain as much as 60,000 tons of cobalt.

Table 3.--Domestic cobalt resources

State	Cobalt metal x1000 tons	Remarks
Alaska	63	Brady Glacier and other magmatic sulfides
Arkansas	+	Manganese
California	18	Mostly nickel laterites
Idaho	36	Blackbird deposit and Coeur d'Alene district
Maine	65	Union deposit and other magmatic sulfide deposits
Minnesota	1000	Duluth complex magmatic sulfides
Missouri	75	Lead-zinc deposits
Montana	100	Stillwater complex
Nevada	+	Goodspring district
New Mexico	3	Blackhawk and other districts
North Carolina	1	Mostly laterites
Oregon	25	Mostly laterites
Pennsylvania	33	Contact metamorphic
Tennessee	20	Ducktown massive sulfides
Vermont	+	By-product from talc
Washington	10	Mostly laterites
Wisconsin	15	Lead zinc ores
TOTAL	1454 +	

Nickel laterites in northern California and southern Oregon contain cobalt in limonite ore. One of these nickel laterites (Riddle, Oregon) is currently being mined and represents the nation's only domestic source of nickel. However, the ores are treated by a pyrometallurgical process which precludes any cobalt recovery. New hydrometallurgical processes have been developed for these ore deposits and may allow the combined recovery of cobalt, nickel, and chromium. The deposit currently being examined most intensely is near Gasque, California and is reported to have between 40-90 million tons of ore with .8% nickel and 0.1% cobalt. The deposit is thus similar in size, but somewhat lower in grade than most actively mined foreign laterite deposits. It is currently undergoing active development work by the California Nickel Company.

The magmatic Duluth complex in northeastern Minnesota contains large tonnages of low-grade copper and nickel sulfides. Although cobalt occurs only in minor amounts (about .04%), the tonnage of this deposit makes it the nation's largest single resource. Currently, only one company has actively been carrying out development work in this complex and even their work has now been temporarily halted due to the low prices of copper. Thus, extraction of cobalt from this resource appears unlikely in the near future.

Potential for domestic development: Most of the world's land-based cobalt is either in nickel laterites, magmatic sulfides, or stratabound copper deposits. The United States has well known examples of the first two of these three deposit types in California, Oregon, Minnesota and Alaska. The United States, however, does not have any known example that are clearly of the important "Zaire-Zambia"-type deposits.

Although containing about 75% of the world's cobalt resources, laterites represent only about 4% of the domestic cobalt resource. U.S. deposits are mostly in northern California and southern Oregon. They are similar in size and grade to many other laterite deposits in the world, but are generally lower in grade than most deposits presently being mined. Chances of locating major unidentified laterite resources are not good.

Magmatic sulfides host most of the domestic cobalt (75%). Mostly this is in deposits in Minnesota and Montana. These deposits are similar in setting to the important cobalt-producing deposits in Canada, but are much lower in grade. Different types of deposits exist in the Norilsk district U.S.S.R. which produces both cobalt and platinum. Examples of this deposit type are not known within the U.S. but areas located near Lake Superior, New Mexico, and along the eastern seaboard contain settings similar to those found in the U.S.S.R. and may host deposits of this latter type. This deposit-type thus may represent a major unidentified resource.

The important stratabound copper deposits in Zaire and Zambia represent another deposit-type for which there is no definitely known domestic type. It is, however, possible that the Blackbird deposit is a severely modified deposit of this kind. Exploration directed towards finding this kind of deposit, both in the Blackbird and other areas, may find significant additional domestic resources.

Finally, deep sea manganese nodules continue to represent a major potential source of cobalt and could serve as an important source of cobalt pending resolution of technological and legal difficulties.

The future development of both the identified and as yet unrecognized domestic cobalt resources will depend on several factors. For the identified deposits, extraction of cobalt will largely be determined by: a) the price of nickel and/or copper, b) the price of cobalt, and c) the existence of an economical extraction process.

However, the development of the as yet unrecognized resources is a much more complicated process. In addition to the favorable economic and metallurgical conditions required for identified deposits, an environment conducive to exploration and development must exist. Establishment of this environment begins with the acquisition of geologic data which may then be integrated in developing geologic models that can be used in defining exploration targets. Examples for cobalt may be the development of target areas for "Zaire-Zambia"- and "Norilsk"- type deposits. Once target areas have been defined, effective exploration further requires the existence of adequate exploration techniques that can detect mineralization and, ultimately, the availability of land on which new geologic ideas and exploration techniques can be tested and in which new deposits can be found.

It must be emphasized that the development of geologic models and new exploration techniques is a never ending process that evolves with the acquisition of new knowledge and development of new techniques. The result is that areas which have been prospected in the past, may uncover new deposits in the future. The finding of new deposit-types in previously well-studied areas is common in the history of mineral exploration, proving that a one-time assessment of a region is incapable of identifying all possible deposits which may be present. A further implication is that lands withdrawn from further geologic study may host important domestic resources which later advances in geologic thinking and exploration techniques could locate.

The potential for finding additional domestic cobalt deposits is good. Perhaps the best exploration models are those provided by the "Zaire-Zambia" deposits and those in the Norilsk area, U.S.S.R. Favorable areas that may host these deposits are in Idaho, Montana, Washington, Minnesota, Michigan, and Georgia. Finding deposits in these areas then would depend on developing the techniques needed to recognize these deposits and in having land available for the exploration for these deposits.

Senator SCHMITT. Thank you, Doctor.

Mr. Giuffrida, you must leave us here shortly; is that right?

Mr. GIUFFRIDA. Yes, sir.

Senator SCHMITT. Let me break with the regular testimony for a few moments, to ask you a couple of questions and then we will let you go, as much as I hate to do that. First of all, is the administration developing any proposals or administrative reorganization plans to try to streamline the needs analysis and decision tree necessary for stockpile purchases or sales?

Mr. GIUFFRIDA. We at FEMA are working with the other involved Government agencies, Mr. Chairman, and have, in fact, been doing some greatly detailed cost-benefit analyses, including economic/social benefits, impacts, combinations of options under title III of the Defense Production Act for a cobalt project proposal. We hope to have that finished in November, and it will suggest that price supports are one of the things that would be as preferable, for example, to loans or loan guarantees, or production guarantees.

Senator SCHMITT. Does the examination include a look at the total national, public, and private national capability for mineral exploration, mineral economics, mining technology development, and so forth?

Mr. GIUFFRIDA. Yes; it does. And in order to give some additional substance to that, I have been, by Mr. Watt, made a member of the Cabinet Council that is addressing this and have now attended two of the meetings and will attend all of them.

Senator SCHMITT. Fine. Have there been studies conducted on the budgetary impact of title III programs related to cobalt versus the option of direct purchaes?

Mr. GIUFFRIDA. Yes; there have.

Senator SCHMITT. Could you summarize the results and maybe provide additional information for the record?

Mr. GIUFFRIDA. That is part of the analysis we hope to have by November, and we will provide that to the committee as soon as it is available.

Senator SCHMITT. We have some research that has been performed by the Congressional Research Service that suggests that previous administrations have encouraged sales of our strategic stockpiles to help reduce the national deficit or to solve certain local economic problems. The stockpile would then be used, in those cases, for what seemed to be purely economic purposes. In contrast to the discussion that we had earlier, what is to keep the present sale of $2.1 billion in silver being used to reduce the national deficit, rather than assisting in the maintenance of the stockpile?

Mr. GIUFFRIDA. Mr. Chairman, the administration requested authorization to appropriate all of those funds to acquire stockpile materials, but Congress authorized only $535 million. All of the sales receipts must go into the fund and can be used only for stockpile purposes. The Congress must insure the prompt use of those funds for stockpile acquisitions by appropriating the funds that would equal the sales receipts. I said a few minutes earlier, sir, that Congress is a key player. That is what the law says and that is what we are going to abide by.

Senator SCHMITT. Thank you, Mr. Giuffrida. We will have some additional questions later, I am sure.

Senator SCHMITT. Let me ask one final thing. Let's assume that we decided collectively, Congress and the administration collectively decided to exercise title III of the Defense Production Act in order to stimulate domestic production of cobalt. Do you currently, within your agency, have the necessary expertise and manpower to oversee your role in such a title III project?

Mr. GIUFFRIDA. Yes, sir, we have the expertise of the entire Government, including the agencies that are represented on this panel. Our job is to provide the analysis and select the options. Our second job is to coordinate and oversee the projects which will, however, be directly monitored by the agency or the department that has that particular necessary expertise.

Senator SCHMITT. But in terms of writing contracts, making sure the deal is clearly understood and so forth, if that were part of the use of title III, do you feel that you are in a position now, with the manpower that you have, to handle such a project?

Mr. GIUFFRIDA. The arrangements are for us to deal with that part of it through GSA, and GSA certainly has all of the talent that is required there, Senator. That is the way it has worked and that is the way it will continue to work.

Senator SCHMITT. OK, sir. Thank you, and give my regards to the President.

Mr. GIUFFRIDA. Thank you, sir. Mr. Paul Krueger from my staff will be here in my place.

Senator SCHMITT. Good. Now, Dr. Morgan, did you have some additional comments?

STATEMENT OF JOHN D. MORGAN, CHIEF STAFF OFFICER, BUREAU OF MINES, DEPARTMENT OF THE INTERIOR

Dr. MORGAN. Thank you, Senator.

Many of the points that I would have made, which are included in my statement, have already been made by others.

On the other hand, I would like to make a few general comments on the Defense Production Act in response to some of the questions that you have raised.

I think it is important, sir, that we keep separate the Stock Piling Act, which has a rather narrow purpose, and the Defense Production Act, which has a much broader purpose. A lot of the discussion about whether we would use an act this morning hinged upon the Stock Piling Act rather than the Defense Production Act per se. The same situation existed years ago in the Korean war period when the Defense Production Act was first passed because we did have then a prior Stockpiling Act which had been passed by the Congress in 1946. The Berlin blockade in 1948 alerted the country to a number of problems, and $1.5 billion was made available for stockpiling prior to the Korean war period. But it was recognized that even that sum, which in those days was a lot of money, was totally inadequate to mobilize the country. Therefore the Defense Production Act of 1950 was passed about 2 months after the Korean war started, providing a much broader gamut of authority than the Stock Piling Act.

In fact, it overrode the Stock Piling Act. And if we are now going to do much to mobilize the country and meet the defense needs, I think we have to look more to the Defense Production Act than the Stock Piling Act.

DEFINITION OF "MATERIALS"

I would like, sir, to cite the definition of "materials" that is contained in the Defense Production Act, because when most people talk of materials, they tend to think of raw materials. And yet the chairman has already alluded to deficiencies in our science and technology base.

Let me read the word "materials" as defined in section 702 of the Defense Production Act:

> The word "materials" shall include raw materials, articles, commodities, products, supplies, components, technical information, and processes.

The Defense Production Act was clearly intended to cover the entire gamut of what would be needed rather than just pile up raw materials such as ores and metals.

Senator SCHMITT. Thank you, Dr. Morgan. I think that's very important that everybody recognize that and that that be emphasized because that is a very broad authority that exists within the act.

Dr. MORGAN. Furthermore, in the Korean war period, the first device that the Government used to expand supplies of everything was tax incentives. These were specifically targeted to 225 named industries, and $37 billion of rapid tax writeoffs were given in the early days of the Korean war.

But this didn't prove to be enough to accomplish what needed to be done because there were cases where investment clearly could not be attracted unless there were some guarantee that investors would at least get their money back. Therefore, that is why under the Defense Production Act over $8 billion of contracts were made in addition to the specific targeted tax incentives.

Looking more closely at cobalt, there are only——

Senator SCHMITT. But I think we should add that in the final analysis, as I understand it, the cost to the taxpayer, direct cost to the taxpayer, was less than $1 billion for those contracts; right?

Dr. MORGAN. That is correct, sir. Later, the Defense Production Act borrowing authority did run up to the $2.1 billion authorized by section 304, but this was the accumulation of interest over a 20-year period. Whereas what should have happened was that the Congress should have written off the expenditures at the time they were made or shortly after the contracts were completed.

I would like to point out use of the Defense Production Act for more advanced items, because I think it indicates one of the problems that the Defense Department will be wrestling with in addition to raw materials. For example, machine tools, more typical of supplies, articles, and components, far beyond cobalt or metal.

At the start of the Korean war, it was recognized that we would need a great number of machine tools. But if we had waited for the DOD to get appropriations, parcel them out among the Army, Navy, Air Force—they, in turn, parcel them out among their prime contractors; they, in turn, go to the fourth-, fifth-, sixth-tier subcontractors—it would have been a year or two before the defense effort would get going.

What we did then was to make immediate contracts with producers for 92,000 machine tools. Such contracts totaled $1.3 billion. The net cost to the Government was less than $8 million, less than 1 percent of that $1.3 billion commitment, and yet that way the machine tools were produced and were on hand by the time the third-, fourth-, and fifth-tier subcontractor needed the machine tool.

If we hadn't done that, we wouldn't have mobilized as fast as we did. And I think in view of DOD's increasing appropriations now and their desire to surge and have an adequate industrial mobilization base that this aspect of the Defense Production Act should be kept before us.

Senator SCHMITT. Doctor, do you feel that other responsible administrative agencies are aware of this history and other aspects of the use of the act, sufficiently to understand the options that may be available to them?

Dr. MORGAN. I think they are aware of it, but they haven't really experienced it. Our Secretary Miller was kind enough to introduce me as one of the experts. I have to point out that the Defense Production Act is 31 years old, and most of the real experts are up in heaven now, looking down on what we're doing, and I just happen to be one of the survivors.

Senator SCHMITT. Well, we have discovered a few other survivors that clearly understand this history.

Dr. MORGAN. People who have not experienced what can be done under those circumstances are a little less likely to see the possibilities.

Senator SCHMITT. My father is looking down, but I certainly did inherit some of his insight on this subject.

Dr. MORGAN. I can assure you, sir, that the highest echelons of the Defense Department, from the Secretary's Office right on down, are aware of these possibilities.

Senator SCHMITT. Have you had extensive discussions with FEMA on this?

Dr. MORGAN. Yes, sir.

Senator SCHMITT. Please go ahead.

Dr. **Morgan**. We've worked back and forth very closely with FEMA and its predecessor agencies over the years.

Senator **Schmitt**. How about that great agency in the sky known as the Office of Management and Budget? Do you think they understand this history?

Dr. **Morgan**. They understand it very, very clearly, sir, as I could tell when they edited my testimony. [Laughter.]

Senator **Schmitt**. You took the words right out of my mouth. [Laughter.]

Dr. **Morgan**. But looking at cobalt specifically—and I would hope, sir, that Mr. Kummer's statement can be put in the record also. He is our cobalt expert.

Senator **Schmitt**. Yes; it will be included in the record.

[The complete statements of Dr. Morgan and Mr. Kummer follow:]

Statement of
Dr. John D. Morgan
Chief Staff Officer - Bureau of Mines
Department of the Interior, Washington, D.C. 20241
before the
Committee on Banking, Housing, and Urban Affairs
United States Senate

Monday, 9:30 a.m., October 26, 1981

Members of the Committee: Ladies and Gentlemen:

It is a distinct honor and a real pleasure for me to appear before your committee at your request to provide some historical perspectives on the use of the Defense Production Act in regard to strategic and critical materials. What follow are personal observations based on service as a senior NSRB-DPA-ODM official from 1948 to 1956, and they are not to be interpreted as necessarily reflecting current official views. It is important to note that, while the DPAct was indeed a major instrument in implementing national security programs in the Korean War period, it was by no means the sole instrument and that there were also other powerful instruments which contributed importantly to the solution of pressing problems.

The need for government-industry cooperation and for specific encouragement of the private sector to manufacture military materiel was recognized almost one hundred years ago in the 1886 report of the Senate's Select Committee on Ordnance and Warships. (S. Rep. No. 90, 49th Cong., 1st Session). Following World War I, the 1919 report of the War Industries Board again stressed the need for government-industry cooperation in planning for and meeting national security needs. Stockpiling of strategic materials was first initiated by the U.S. Government a few years prior to our entry into World War II but stockpiles were grossly inadequate at the time of the enemy attack upon Pearl Harbor. As a consequence, massive priorities and allocation programs were required in World War II to channel limited supplies of materials to essential defense production, and costly and inefficient supply expansion programs for many strategic and critical materials had to be superimposed upon the strained war economy. Our World War II materials position would have been worse were it not for the cooperative efforts of Allied Nations that made the resources of Latin America, Africa, Australasia, and the unoccupied portions of Asia available to the allied war effort. The final reports of the War Production Board and its successor Civilian Production Administration stressed the need for government-industry cooperation in mobilization planning and in the implementation of national security programs.

The first major post-World War II action was the passage of the Strategic and Critical Materials Stock Piling Act of July 23, 1946. This Act placed responsibility in the Secretaries of War, Navy, and Interior, acting jointly through the agency of the Army and Navy Munitions Board. The National Security Act of 1947 created the unified national military establishment, the National Security Council (NSC), the Central Intelligence Agency (CIA) under the National Security Council, and the National Security Resources Board (NSRB) to oversee the coordination of military, industrial, and civilian mobilization. The importance of appropriate planning with U.S. allies led in 1949 to the formation of the Joint United States - Canada Industrial Mobilization Committee to coordinate plans for industrial mobilization "in order that the most effective use may be made of the productive facilities of the two countries." There had been clear warnings of the unreliability of some supplies. In 1948 we had been getting about one-third of our manganese and chromium from the USSR but following the Berlin Blockade of that year the USSR sharply reduced shipments and ceased them by 1951. In the period prior to the Korean War period strategic stockpiles were built-up through a variety of programs including transfers to the stockpile of World War II surpluses, barter by the Commodity Credit Corporation of agricultural surpluses, purchases with counterpart currencies derived from U.S. foreign aid programs, and direct purchases under the Stock Piling Act for which over $1.5 billion was provided prior to the Korean War. Despite all of these activities at the start of the Korean War materials on hand were valued at only $1.6 billion compared to stockpile goals of $4.1 billion.

The start of the Korean War on June 25, 1950, came less than five years after the end of World War II. Consequently, there were still many persons in uniform and in the civilian agencies of government and in the private sector who had recent experience in mobilizing the nation's resources. In the Korean War period the full resources of the regular Federal departments and agencies were utilized, augmented by 25,000 additional persons in emergency agencies. The NSRB had drafted standby legislation based upon the total experience of World War II. This standby legislation was promptly reviewed, presented to the Congress, and enacted into law on September 8 as the Defense Production Act of 1950. The DPAct placed all authority in the President, allowing him to create agencies and to delegate authority as necessary. The declaration of policy stated that "The United States is determined to develop and maintain whatever military and economic strength is found to be necessary...." It went on to state ". . . this task requires diversion of certain materials and facilities from civilian use to military and related purposes. (and) It requires expansion of productive facilities beyond the levels needed to meet the civilian demand."[*]

([*] *Changed by the 1955 Amendments to read "It also requires the development of preparedness programs and the expansion of productive capacity and supply beyond the levels needed to meet the civilian demand, in order to reduce the time required for full mobilization in the event of an attack on the Unites States."*)

It further stated that "... normal civilian production and purchases must be curtailed and redirected." To accomplish those purposes, the DPAct provided broad authority: Title I - Priorities and Allocations; Title II - Authority to Requisition (to which "and Condemn" was shortly added); Title III - Expansion of Productive Capacity and Supply; Title IV - Price and Wage Stabilization; Title V - Settlement of Labor Disputes; Title VI - Control of Consumer and Real Estate Credit; and among other things Title VII provided authority to make voluntary agreements conferring exemption from the antitrust laws and the Federal Trade Commission Act. The clear intent of the Congress to provide at the outset the broadest possible authority was confirmed by the definition of the word "materials" as contained in Section 702(b) of the original DPAct: "The word "materials" shall include raw materials, articles, commodities, products, supplies, components, technical information, and processes."

Notwithstanding the very broad authority of the DPAct, the Congress in the early days of the Korean War period provided another very powerful tool for the expansion of the defense mobilization base. In those years the useful life of heavy equipment for depreciation purposes, as specified by the Treasury Department, in many cases was two decades or more, and straight-line depreciation was the common rule. Consequently, annual depreciation in heavy industry was only a few percent. Further, there was then no investment tax credit and in war periods there were excess profits taxes. Section 124A of the Internal Revenue Code, enacted on September 23, 1950, reinstated rapid depreciation, which had been authorized for war purposes in World Wars I and II. Section 124A (later Section 168 of the Revised Code - repealed

October 4, 1976) provided for 5-year depreciation for facilities certified as necessary in the interest of national defense by a certifying authority appointed by the President. Although enacted in September 1950, 124A permitted certification of facilities acquired or completed as early as January 1, 1950. Under this authority as of March 1953, 225 specific industrial expansion goals were established for the following industries:

Abrasive products
Acetic acid
Acetone
Aircraft, commercial
Aircraft (military)
Air preheater, regenerative
Aluminum, primary
Aluminum sheet, heat-treating facilities.
Aluminum-sheet-producing facilities.
Ammunition boxes, 30 and 50 caliber.
Aniline
Anthraquinone vat dyes
Anti-friction-bearings industry
Antimony
Asbestos, chrysotile, strategic grades.
Barite (drilling grade and chemical grade).
Batteries, AA type
Bauxite
Benzene
Benzene hexachloride, 99 percent or more gamma isomer content (lindane).
Benzene hexachloride, technical grade.
Beryl
Beryllium copper alloy mill products facilities.
Beryllium copper master alloy producing facilities.
Blast furnaces
Blast-furnace ferroalloys
Boilers, steam
Brass-mill facilities
Butadiene
Calcium carbide
Carbon, activated (water purification and decolorizing grade).
Carbon black
Carbon electrodes
Carbon tetrachloride
Castings, steel
Chemical manufacturing machinery.
Chlorine
Chromite, chemical grade
Chromite, metallurgical grade
Chromite, refractory grade
Cobalt
Coal, Territory of Alaska
Coke, byproduct
Columbite and tantalite ores (60 percent concentrates).
Compresses, cotton
Condensers
Continuous galvanized sheet and strip.
Copper
Copper-foundry facilities
Copper-wire-mill products
Crawler-type-tractor industry
Cryolite, synthetic
Cylinders, pressed gas
DDT
Dies, jigs and fixtures
Electrical connections, Army-Navy type.
Electric power
Electrolytic tin plate
Electronic glass envelopes produced by means other than on ribbon machines.
Electronic glass envelopes produced on ribbon machines.
Electronic products (military)
"Elephant tools," manufacturing facilities.
Ethylene glycol
Ethylene oxide
Ferro-alloys, electric furnace
Fibrous glass, continuous filament
Fibrous glass, superfine
Filter aids, calcined diatomite
Fluorspar, acid grade
Formaldehyde
Freight cars
Friction bearings
Gas utility industry, large pipeline
Gas utility industry, small pipeline
Gears and gear drives
Generators, water-wheel driven
Gins, cotton
Glass tubing, rods, and cane (borosilicate).
Glass tubing, rods, and cane (lead and soda-lime).
Glycerin
Graphite, artificial
Gray iron castings (over 3,000 lbs.)
Heat exchangers, tubular
Heavy aluminum aircraft forgings
Heavy metal tanks (special process and storage vessels).
Hexamethylenetetramine
High voltage switch gear
Hose horizontal wire braided
Hydrofluoric acid
Hydrogen, peroxide
Industrial ethyl alcohol
Inland Waterway vessels
Iron ore
Iron ore, taconite
Iron oxide, yellow (synthetic)
Kenaf, processing facilities
Ketone, methyl-ethyl
Ketone, methyl-isobutyl
Laboratories
Lead
Limestone and dolomite
Lithium compounds
Locomotives, diesel
Lubricating oil
Lumber and wood products
Machine tools
Magnesium
Maleic anhydride
Manganese, metallurgical grade
Manganese ore, battery and chemical grades.
Material handling equipment
Mechanical power transmission equipment (except gears).
Medical supplies and equipment
Mercury
Metal can manufacture, tin conservation.
Metal cans
Metal cutting tools
Metalworking equipment, miscellaneous.
Methanol, synthetic
Methyl chloride
Methylene chloride
Mining machinery
Molybdenum
Motors, miniature electric
Naphthalene
Newsprint
Nickel
Nitrogen
Octyl alcohols
Optical glass
Optics, precision cut, facilities for producing.
Ore carriers, Great Lakes
Ore carriers, Oceangoing
Ordnance facilities
Oxygen, high purity
Paper
Paperboard
Penicillin
Pentaerythritol
Perchlorethylene
Petroleum, domestic, drilling of wells.
Petroleum, domestic, natural gas liquids production and processing facilities, capacity.
Petroleum, domestic, oil pipelines
Petroleum, domestic, refining capacity.
Petroleum, domestic, storage capacity.
Petroleum, foreign, drilling of wells.
Petroleum, foreign, oil pipelines
Petroleum, foreign, refining capacity.
Petroleum, foreign, storage capacity.
Phenol
Phosphate rock
Phosphatic feed supplements
Phosphatic fertilizers
Phosphatizing of steel drums
Phosphorus, elemental
Photographic equipment (motion and still).
Photographic film and paper
Phthalic anhydride
Plastics materials
Plywood, exterior type, softwood
Polyamide fibers, organic chemicals for adipic acid.
Polyamide fibers, organic chemicals for adiponitrile.
Polyamide fibers, organic chemicals for cyclohexane (85 percent).
Polyamide fibers, organic chemicals for hexamethylenediamine.
Portland cement
Potash
Power crane and shovel industry
Precision and large size fasteners
Presses and forging equipment
Pumping machinery
Quinoline
Railroad equipment
Rare earths
Reels and spools
Refractories, basic
Refractories, fire clay, superduty and high alumina bricks.
Refractories, insulating firebrick
Refractories, Ladle bricks
Refractories, pouring
Refractories, silica
Resorcinol
Railroad terminal and road facilities.
Rubber and rubber products
Rutile
Scientific instruments
Scrap, ferrous and nonferrous
Screw machine products, precision
Sebacic acid
Selenium
Soda ash
Sodium bichromate
Sodium chlorate
Sodium cyanide
Special components
Special industrial services
Steel ingots
Storage batteries, electric
Strapping steel
Styrene monomer (including methyl styrene).
Sulfur
Sulfuric acid
Synthetic fibers, noncellulose
Tankers, oceangoing
Tape, acetate
Tape, filament
Tapered aluminum sheet
Telegraph, domestic system
Tetraethyl lead
Tetraethyl lead chemicals ethyl chloride.
Tetraethyl lead chemicals, ethylene dibromide.
Tires (specific types)
Titanium dioxide pigment
Titanium metal
Toluene
Transformers, distribution
Trichlorethylene
Tungsten ore
Turbines, hydraulic
Turbines, steam
Valves and fittings, industrial
Vehicles and engines, military
Vulcanized fibre
Welded aluminum tubing
Wood pulp
Zinc

Specific facilities within these industries were individually certified. Major expansions of industrial capacity were accomplished through this device. For example, rapid depreciation alone was sufficient to add nearly one-quarter to U.S. steel capacity. In the period from October 1950 through December 1956, industrial expansion valued at $37 billion was certified, of which 61%, or $22 billion, was eligible for rapid depreciation. The total amount then certified in materials-related industries was as follows:

Mining	$2.2 billion
Primary metal industries	$5.7 "
Chemical and allied products	$2.9 "
Products of petroleum and coal	$3.0 "
Pipeline transportation	$1.4 "

Use of the tax laws to encourage domestic production of strategic minerals is not limited to periods of war or national emergency. As a general rule, minerals considered more strategic are allowed higher percentage depletion rates. Exploration for minerals is also specifically encouraged by the tax laws. Indeed, the recently enacted Economic Recovery Tax Act of 1981 provides accelerated depreciation of plants and equipment for mineral producers and other industries.

The prevailing philosophy governing expansion of the defense mobilization base in the Korean War period was to get the most competent organizations to do the job as quickly as possible at the lowest cost to the government and with least government involvement. Only the minimum incentive necessary was utilized. Rapid depreciation was normally the first instrument employed on the theory that those who were willing to invest their own money would be the most prudent in the expenditure thereof and that the longer-term tax base would most likely be enhanced. Only when the possibilities of rapid depreciation were exhausted was recourse had to Title III of the DPAct. In Title III cases long-term contingent procurement contracts were the preferred instrument, on the theory that future government expenditures might not be required at all, or, if they were, that expenditures would be made only for materials meeting specifications. Loans and guarantees of loans were generally instruments of last resort because the risks to the government were greater. Where possible other tangible assets were subordinated to loans. All operations were conducted in a goldfish bowl. General program expansion goals were developed in consultation with industry advisory committees and published for the information of all interested or concerned parties. Applications under the goals were processed starting with those needing the least assistance, and press releases were promptly issued covering incentives granted on a case-by-case basis. Further, provision was made for concurrent on-the-spot audits of contracts by the General Accounting Office (GAO). Where major government financing was involved, technically qualified government project officers were stationed at the project sites to provide continual inspection and reporting.

Only Titles I, III, and VII of the DPAct are currently extant. Titles II, IV, V, and VI were terminated only a few years after enactment. Wage and price controls authorized by Title IV and consumer and retail credit controls by Title VI were considered essential because defense spending rose from $13 billion (5% of GNP) in 1949 to $46 billion (13% of GNP) by 1952. In 1952 more than 17,000 persons were employed in the Economic Stabilization Agency. The efforts to control prices involved voluminous regulations and detailed additions to Title IV. For example, Sec. 109(c) of the 1952 amendments went into such detail as to exempt "prices charged and wages paid by bowling alleys." Consumer prices, based on 1947-9 = 100, rose from 101.8 in June 1950 to 114.7 in July 1953, but the index for 22 raw materials fell from 97.9 in June 1950 to 88.3 in July 1953. Metals which had registered 104.0 in June 1950 dropped to 96.3 in July 1953, reflecting increased supplies resulting from the 124A and Title III supply expansions. Title II - Authority to Requisition and Condemn and Title V - Settlement of Labor Disputes were little used but the mere fact of their existence significantly facilitated operations under other titles and statutes. These titles terminated as follows: IV and V on April 30, 1953, and II and VI on June 30, 1953.

Title VII - General Provisions of the DPAct covered a wide spectrum. Its Section 708 authorized the making of voluntary agreements which, for specific limited objectives, provide immunity from the antitrust laws and the Federal Trade Commission Act. During the Korean War period 77 voluntary agreements were approved by the Attorney General - 31 were Army integration committees (for example: ammunition loading, propellants and explosives, small arms ammunition), 5 Air Force production committees, 12 miscellaneous, and 29 small business production pools. 4 or 5 of the Army ones, including those named, are still in standby status. The Interior Department's Petroleum Administration for Defense and successor agencies made extensive use of Section 708 voluntary agreements to maintain petroleum supplies by adjusting tanker lifts and refinery runs, not only for U.S. supplies but also for friendly foreign nations, in 1951 following the Iran oil nationalization, in 1956 when Nasser closed the Suez Canal, and in 1967 when the Suez Canal was again closed and the Iraq pipeline also closed. Voluntary agreements were considered again in the 1973 Arab oil embargo, but Title I DPAct authority and special energy legislation, some still in effect, was utilized instead. In 1955 new Section 710(e) established the National Defense Executive Reserve which currently has about 2,000 members. In more recent years amendments to Title VII, especially to Section 708 and the addition of Section 719 - Cost Accounting Standards Board, have added provisions making application of the DPAct more complicated than was the case in the Korean War period.

The Declaration of Policy of the DPAct stated that ". . . this task requires diversion of certain materials and facilities from civilian use to military and related purposes." To direct limited supplies to pressing programs recourse was had to the authorities provided by Title I of the DPAct. Priorities were initially established which required that rated orders from the Department of Defense and other designated authorities be filled first. Soon however, as about 10% of the normal supply was covered by priorities, the system began to show excessive strain. Next in strength came allocations whereby the government distributed the entire available supply among claimants identified by the regular and emergency federal agencies. Conservation and limitation orders were employed to limit or forbid completely certain uses. The heart of the allocation system was allocation of the four "Controlled Materials" - steel, aluminum, copper, and nickel - on the theory that controlling these four - based on World War II experience - would also control many other production activities. Special assistance was rendered in many other cases where other strategic materials were involved. An agreement between the Department of the Interior and Commerce (still in effect as FR 67-1313) spelled out the precise responsibilities of each - with mines, concentrating plants, smelters, and refineries under Interior jurisdiction and the products of refineries under Commerce jurisdiction. A mining machinery division was staffed jointly by the two Departments. Agriculture had jurisdiction over agricultural commodities. During the Korean War period the International Materials Conference (IMC) was established under authority of the DPAct to allocate materials on an international basis and to assist in expanding supplies. Seven IMC committees were constituted covering cotton linters, paper pulp, wool, copper-lead-zinc, manganese-nickel-cobalt, tungsten-molybdenum, and sulfur. By early 1953 only nickel and molybdenum remained under international allocation, and nickel ended in September 1953. The Title I authority has continued in use ever since the Korean War and it was utilized extensively in the Vietnam War period. It continues today with the Department of Commerce maintaining the Defense Materials System with "set-asides" for steel, aluminum, copper, and nickel alloys and the Defense Priorities System with "DO" and "DX" ratings. In the past three decades Title I authority has been used not only for just Department of Defense programs per se but also for many other programs coming under the broad definition of "national defense" in Section 702(c) of the DPAct. Several examples follow:

- Federal Aviation Agency (in the 60's) for the national airspace system of air traffic control, communication, and navigation.
- Maritime Administration (in the 60's) for vessels.
- NASA for space vehicles.
- Atomic Energy Commission for its activities.
- GSA (in the 60's) for southeast Asia counterinsurgency items.
- Coast and Geodetic Survey (in the 60's) for vessels.
- Interior (in the '73 oil embargo) for petroleum.
- President (in '67, '70, '71) for rail transportation (in strikes).
- FPA-Commerce (in '74) for the Alaska pipeline.

Various combinations of increased set-asides, export controls, sales of government excess materials, and stockpile releases were used in past decades to assure defense production threatened by copper strikes in Chile and Zambia in 1965, major nickel strikes in Canada in 1966 and 1969, and a major copper strike in the U.S. in 1967-68.

Title III provided broad authority for expanding supplies of materials - making specific provisions for: loans or guarantees of loans for exploration, development, and mining of strategic and critical metals and minerals; purchases of or commitments to purchase metals, minerals, and other materials, for government use or resale; the encouragement of exploration, development, and mining of strategic and critical minerals and metals; and the development of substitutes for strategic and critical materials. The $600 million borrowing authority initially provided soon proved to be completely inadequate, and the 1951 Amendments provided $2.1 billion borrowing authority with the proviso that contingent liability need be considered as an obligation only to the extent of the "probable ultimate net cost." Basic materials expansion programs as of June 30, 1956, reached $8.4 billion in gross transactions with probable ultimate net cost of $0.9 billion. Major materials programs included:

Aluminum	$1.5 billion	Tin	$0.2 billion
Titanium	0.9	Molybdenum	0.2
Rubber	0.9	Magnesium	0.1
Nickel	0.9	Cobalt	0.1
Copper	0.7	Columbium-Tantalum	0.1
Manganese	0.4	Other materials (more than 50)	0.4
Tungsten	0.4		

In a few years these programs led to a doubling of U.S. aluminum production; an increase of U.S. copper mine capacity by a quarter, initiation of U.S. nickel mining, creation of the titanium industry, quadrupling of U.S. tungsten mining, and a great expansion of the world columbium-tantalum mining and processing industries, as well as expansion of supplies of many other materials for production needs and stockpiles.

An outstanding example of the contribution of Title III to the rapid strengthening of the defense industrial mobilization base in other than basic materials was provided by the machine tool program. Prior to the Korean War, the Department of Defense and the Department of Commerce identified a number of common machine tools that would be needed in the event of mobilization. To avoid the delays that would normally take place as defense appropriations were secured, then prime contracts for military materiel let, then subcontractors and third, fourth, and fifth tier sub-subcontractors involved before machine tools were purchased, orders were placed directly by the General Services Administration (GSA) with manufacturers. More than 92,000 machine tools were covered by pool orders valued at more than $1.3 billion. GSA promised to pay 82.5% of the list price if the tool builder did not have an order by completion date. The tools were produced promptly and were ready when needed by defense subcontractors. The machine tool backlog was reduced from 18 months in January 1952 to 12 months by September 1952 and to 7 months by July 1953. Total losses in this program were less than $8 million or substantially less than 1%.

A program to explore for minerals was originally launched under the Defense Production Act - the Defense Minerals Exploration Administration (DMEA) program of 75% or 50% government participation in approved projects, with the higher percentage applicable to the more strategic minerals. This program was later made a permanent program in 1958 by Public Law 85-701, administered by the Office of Minerals Exploration of the U.S. Geological Survey. The last major use of the DPAct for nonfuel minerals was an $83 million loan in 1967 in the Vietnam War period to facilitate the Duval Sierrita copper mine development.

In conclusion I should like to interject a note of caution as we look back at the successful use of Section 124A of the Internal Revenue Code and Title III of the Defense Production Act in the Korean War period. As I indicated earlier in my statement less than 5 years had elapsed from the end of World War II on September 2, 1945, to the start of the Korean War on June 25, 1950. Consequently, not only were there many persons available with practical mobilization knowledge but there was also a reliable backlog of information on mineral deposits and processes that had been developed in the World War II period through the War Minerals Investigations of the U.S. Geological Survey and the Bureau of Mines in cooperation with the private sector. Many mineral deposits were known, not only in the United States but also in allied nations, and methods of mining, concentrating, smelting, and refining had also been worked out, thus shortening the time required to commence production. Also, three decades ago the Federal and State regulatory climate was far more conducive to rapid development. There were only 7,952 pages in the 1949 "Federal Register" and, at the height of the Korean War, in 1951 only 13,175 pages, in contrast to 87,012 pages in 1980. Moreover, many of the easily-discoverable near-surface mineral deposits were found in World War II and the Korean War, requiring today far more difficult searches for deep-seated deposits, which often turn out to be of a lower grade, requiring far more extensive processing. It takes many years to find a hidden mineral deposit and many more to develop a deep mine or a major open pit and ancillary facilities. Consequently, serious assessment of our current defense posture and the role of the DPAct, as is currently under way in this Committee, is of fundamental importance to the survival not only of our nation but also of the free world.

Your letter of invitation requested specific discussion of the applicability of Title III of the DPAct to domestic expansion of cobalt mining. It should be noted that much cobalt is produced in the world as a byproduct or coproduct of the mining of other metals, most notably nickel and copper. However, there are some mines at which cobalt is the primary product. During the Korean War expansion of copper, cobalt, and nickel mining was eligible for rapid depreciation for tax purposes and also for guaranteed contingent purchase contracts under Title III. The primary objective of the Korean War activities was to expand productive capacity in the United States and in strategically accessible foreign sources to meet defense production requirements including stockpiling. At that time stockpile planning was based on a 5-year emergency; hence, every one unit of new domestic productive capacity reduced the stockpile goal by five units. The largest Korean War cobalt contract was DMP 134 with the Freeport Nickel Co. (Cuban mines) covering 23,835,000 lbs of cobalt for $47,747,000, plus 271,000,000 lbs of nickel for $200,540,000 - total probable ultimate net cost (PUNC) $105,000. The PUNC is as of September 30, 1974, and thus reflects the final costs when books were closed on the Section 304 borrowing authority. The second largest was DMP 123 with the African Metals Corp. covering 13,602,147 lbs of Congo cobalt for $25,428,000 - PUNC $4,958,000. Two domestic contracts were D 18104 with the Calera Mining Co. covering 6,501,500 lbs of nickel-cobalt alloy containing not less than 93% cobalt mined in Blackbird, Idaho, for $14,801,000 - PUNC $2,454,000, and DMP 131 with the National Lead Co. covering 3,762,000 lbs of cobalt mined in Fredericktown, Missouri, for $9,822,000 - PUNC $5,097,000, plus PUNC of $7,137,000 reflecting costs of the nickel plant, plus 1,850 s. tons of copper for $1,342,000 - PUNC $74,000. Other cobalt contracts included DMP III-II with the Rhodesian Congo Border Power Corp. for 4,027,449 lbs of Northern Rhodesian cobalt for $7,216,000 - PUNC $1,027,000, and 34,316 s. tons of copper for $20,007,000 - PUNC $1,882,000; and two contracts with Falconbridge Nickel Mines, Ltd. for Canadian cobalt: D 12205 for 1,235,405 lbs of cobalt for $3,133,000 - PUNC $423,000, plus 37,037,000 lbs of nickel for $31,207,000 - PUNC $6,588,000, and DMP 60 for 147,106 lbs of cobalt for $357,000 - PUNC $55,000, plus 15,978 s. tons of copper for $9,362,000 - profit of $335,000, plus 106,100,000 lbs of nickel for $138,413,000 - PUNC $56,799,000. In total the Title III DPAct cobalt program covered 53,110,607 lbs of cobalt for $108,504,000 - PUNC $14,119,000. It stimulated cobalt production in several nations, met defense needs including stockpiling, and hastened the end of domestic and international allocations. U.S. mine production rose from 809,000 lbs in 1950 to a peak of 4,844,000 lbs in 1958, and then tapered off slowly to 0 in 1972 as guarantees came to an end.

There are at least two possible near-term domestic cobalt mine projects - both of which were producers in the Korean War period. The old Calera project is now known as the Blackbird project of Noranda and could produce 5,000,000 to 7,000,000 lbs per year and the Fredericktown, Missouri, project is now known as the Anschutz Madison project and could produce 1,000,000 to 2,000,000 lbs per year. Longer-term possibilities include complex multi-metal deposits in Missouri, Minnesota, and California, and deep-sea nodules. Neither is economic at current market prices, and both companies have indicated that prices would have to be in the $20 plus per pound range for economic production.

We are currently evaluating the costs, benefits, and other issues associated with Title III. As you may know the Administration's economic, tax, and regulatory reforms will place capital-intensive industries in a much better competitive position than previously. Although Title III may provide one way of meeting stockpile goals and otherwise improving our readiness posture, it does involve intervention in the market place. This runs counter to the Administration's policy. Analyses completed to date of the use of Title III versus stockpile purchases are inconclusive. We will continue to review this question, but for now the Administration does not favor the use of Title III.

I appreciate the opportunity of appearing before you and will be delighted to try to answer any questions.

Statement of
John T. Kummer
Cobalt Commodity Specialist - Bureau of Mines
Department of the Interior - Washington, D.C. 20241
Before the Committee on Banking, Housing, and Urban Affairs
U.S. Senate

Monday, 9:30 a.m., October 26, 1981

Members of the Committee: Ladies and Gentlemen:

Cobalt has been identified as a strategic and critical metal owing to its essential defense-related uses by U.S. industry and to the high degree of import reliance for its supply. Current world mine production of cobalt is slightly greater than 60 million pounds. Zaire and Zambia provide approximately 50% and 10%, respectively, of world output. Other countries with significant mine capacity include Australia, Canada, Cuba, Finland, Morocco, the Philippines, and the U.S.S.R. Each of these nations are estimated to produce 3% to 6% of world output.

Most cobalt is recovered as a by-product or co-product of copper or nickel mining. To a large extent, cobalt supply depends on the demand for copper and nickel and the economics of their production. Likewise, the expansion of cobalt output from established sources is partially a function of expectations for future copper and nickel demand.

Historically, domestic mine production of cobalt has furnished only a minor portion of U.S. demand and mine output ceased entirely in 1971. Since 1971, imports have supplied 92% to 99% of our annual requirements; recycling accounts for the balance. Zaire, the world's chief mine producer, has also been the major source of U.S. imports. Over the last decade, direct and indirect (through Belgium-Luxembourg) imports of cobalt metal from Zaire have amounted to about 60% of total imports. Other significant mine producers and exporters to the United States include Zambia, Canada, and Finland. Refined metal and chemical compounds are also imported from Norway, Japan, France, and several other countries.

These countries possess facilities to refine or purify cobalt metal or produce cobalt chemicals from imported feedstock.

The United States has one refinery capable of producing about 1 million pounds of cobalt annually. Raw materials for this refinery are imported from Australia, Botswana, New Caledonia, and the Republic of South Africa. Last year a facility was opened to produce about 1 million pounds of extra fine cobalt powder annually from imported metal. This highly upgraded form of cobalt is used to produce carbide cutting and wear-resistant materials. Other U.S. firms have the capability to produce cobalt chemicals and catalysts for domestic consumption. It should be emphasized that all U.S. refinery and conversion capacity is dependent on imported feedstock.

Total U.S. demand for cobalt has ranged between 14 and 24 million pounds annually since the mid-1960's. These levels of demand represent an estimated 1/4 to 1/3 of total world demand. About 70% to 75% of the cobalt utilized is in some form of metal, such as cathodes, granules, or powder. Metal required for most industrial uses is at least 99.6% pure and specifications generally include maximum contents for certain impurities. Cobalt oxides, various inorganic and organic compounds, and scrap materials account for 25% to 30% of domestic use. Demand for cobalt is based on a wide range of essential applications, the most significant of which will be briefly summarized.

The production of superalloys accounts for roughly ½ of the cobalt metal used domestically. These alloys are usually nickel or cobalt based, contain from 1 % to 65% cobalt, and have been designed for materials subjected to high stresses at high temperatures and/or to highly corrosive environments. Cobalt-containing superalloys are utilized in aircraft turbines, jet engine and airframe parts, industrial turbines, power generation equipment, and in other technologically advanced industries. Research and development is trying to reduce the cobalt content in superalloy formulations without sacrificing performance characteristics. This work has been prompted by the potential for supply disruptions and recent price escalation.

An essential application for cobalt metal powder is to provide the binder, or matrix, for cemented carbide products used in metal cutting tools, dies, rolls, punches, and the wear surfaces of high speed machinery. Cemented carbides are also used in mining equipment and drill bits and for armor-piercing ammunition. The commonly used tungsten and mixed metal carbides contain 6% to 15% cobalt as binder. Satisfactory substitutes in this important application have not been developed.

There are other significant metallurgical applications for cobalt. Several types of high-speed tool steels contain 5% to 12% cobalt to enhance resistance to softening at elevated temperatures. Coating, or hard-facing, with certain cobalt-containing alloys improves the resistance of machine or equipment surfaces to abrasion, impact, or corrosion. Cobalt is an important constituent in alloys used in prosthetic devices and the dental field. Cobalt-containing magnetic alloys are employed as components in loudspeakers, electrical and telecommunications equipment, and permanent magnet motors. In magnetic applications, cost considerations have apparently stimulated substitution away from cobalt alloys in the last two years.

Nonmetallurgical uses comprise 25% to 30% of domestic cobalt consumption. Used alone or in combination with other metals, cobalt is a constituent in numerous catalysts used in various chemical processes. A cobalt-containing catalyst is commonly used for petroleum desulfurization. Cobalt oxides and organic compounds are used in paints, pigments, and allied products such as ceramics, glass decolorizers, driers, and dyes. Cobalt oxide is employed in a ground coat frit-to increase the adherence of enamel to metal surfaces. Cobalt has been identified as a micronutrient and is sometimes added to soil fertilizers or animal feed as a nutritive agent. The isotope cobalt-60 is a principal source of gamma radiation for industrial and medical use. It is used in biological and chemical research and in industrial radiography for investigating physical strains and defects in metals. Effective substitutes have not been found for cobalt in its major catalytic and pigment-related applications.

Leaving current supply and consumption patterns aside, what are the prospects for the future? It is apparent that cobalt reserves contained in established, producing source areas outside the U.S. are sufficient to provide U.S. and world needs well into the next century. Zaire and Zambia account for approximately ½ of these reserves and the other producing countries, the remainder. A reasonable projection for the worldwide increase in cobalt demand is in the range of 2.5% to 3% per year for the remainder of this century. At this growth rate, annual demand for primary cobalt by the year 2000 could reach 35 million pounds in the United States and could total 95 million pounds for the world. With current output capacity at about 65 million pounds, additions to productive capacity will be required by the end of the century. In the near term, present capacity and probable additions should supply world needs into the mid-1980's. However, it is possible that periodic shortages may occur because of reduced copper or nickel production, surges in demand, and political or military interruptions of production.

The prospects for domestic output are uncertain. There are potential sources for cobalt in the United States that are being actively evaluated by mining firms. However, their development would require considerable capital and is contingent on the firms' analyses of future prices and profitability. If the former Madison mine in the lead belt of southeastern Missouri were reopened, it could yield 1 to 2 million pounds of cobalt annually by the mid-1980's. Production of cobalt from the Blackbird sulfide district in Idaho could yield from 5 to 7 million pounds annually in the next several years. Lateritic deposits in northern California might also be developed by 1990. The development of one or more of these prospects could result in domestic production ranging from 2 to 10 million pounds annually by the end of this decade. Whether this would take place absent some form of government guarantee is uncertain at this time. In the longer term, the mining of deep seabed manganese nodules could supply a significant share of U.S. and world needs by 2000 or somewhat later.

Dr. Morgan. He has listed a number of the possibilities, but there appear to be in the short term only two. One is the Blackbird project, which could produce 5 to 7 million pounds per year. The other is the Madison project. That could produce 1 to 2 million pounds per year.

Dr. Foose has pointed out that these are in——

Senator Schmitt. The Madison project being the California——

Dr. Morgan. No, sir, the Missouri project. The California project, I think, is a little further behind those first two. It could produce maybe 1 to 2 million pounds a year. And further down the road, of course, are ocean nodules in which cobalt is an important constituent.

Senator Schmitt. Is anybody looking at the Lobo Peak area in southern New Mexico?

Dr. Morgan. Not as far as I know, sir.

Senator Schmitt. Dr. Foose, are you aware of any current interest in Fuller Peak?

Dr. Foose. No. I am not.

Senator Schmitt. That is a cobalt-nickel association.

Dr. Foose. I am only aware that the resources are estimated to be quite small. But the mode of occurrence is similar to the Cobalt Ontario deposits. However, Cobalt Ontario is not even producing at this time.

Senator Schmitt. I understand. But one thing that we geologists look for are similarities of associations to see if there are any hints on a broader potential for reserves beyond which may be currently defined.

Dr. Morgan. The primary purpose of the Defense Production Act, and the reason why we drafted it and implemented it in the Korean war period, was to guarantee that expansion of productive capacity would take place. As General Giuffrida pointed out here earlier, every one pound of new domestic productive capacity reduces the need for a sterile stockpile by three because in planning for a 3-year war that is the major multiplier in the equation.

When you hear testimony this morning that the spot price of cobalt is in the vicinity of $11 to $12 a pound--and I have heard testimony in other hearings that the cost of production in Zaire is on the order of $3.50 a pound—I think that any U.S. company would be rather reluctant to make substantial investments in the face of the possibility that the market could drop well below their cost of production. And that was the purpose of the Defense Production Act—to assure that they would at least come out whole if they made required investments.

The two projects that we are referring to, the Blackbird mine and the Madison mine, both were producers in the Korean war period. And in that time, domestic production rose from somewhat less than 1 million pounds per year to nearly 5 million pounds per year. And so we are not talking about an economic theory or some far out scientific proposal. Both of these properties were actual producers under the Defense Production Act in the past.

I have testified before other committees that I think the real enemy of production is the U.S. Government, not primarily because of some of the land restrictions that Secretary Miller has alluded to—which are clearly factors and he is working to straighten them out—but because the U.S. Government will give you 15 percent on your money for 30 years with no risk. That is what Government bonds sold for the other day; it was about 14.8 percent—and therefore any mineral venture, many of which are highly speculative, would have to show a rate of return considerably in excess of that in order to induce a board of directors to go into it. And that is why we are looking very closely at title III of the Defense Production Act.

Senator SCHMITT. Do you have any suggestions as to any model that might be examined more closely?

INTERNATIONAL BARTER SYSTEM

Dr. MORGAN. Well, I think in this examination that is underway at the highest levels of the Government, we have to look not only at domestic production but at production in other strategically secure sources. And I think we should also look at the possibilities of barter which were alluded to here earlier. I gather that this is a——

Senator SCHMITT. That, I think, is a very underlooked and underestimated way in which we might handle the strategic minerals problems. We should really start to develop an international barter system for these kind of materials. It is much to the benefit of the country producing as well as to our own benefit in terms of the flow of dollars.

Dr. MORGAN. Yes, sir; I think this is true. And if one goes back and looks at the Agricultural Trade Development and Assistance Act of 1954 and the barter provisions thereunder, substantial quantities of strategic materials were acquired by the United States by that route, and hungry people who could produce strategic materials but had no other way of earning money were fed.

For example, at the present time, I gather that there is over $1 billion worth of surplus butter, cheese, and dried milk in Agriculture Department inventories which is in danger of deterioration, spoilage, and incurring costly storage charges. And Zaire is a country with hunger and cobalt. Quite possibly, some barter arrangement might be worked out there.

So we have to look at all the possibilities—what the cost would be for subsidizing domestic production or guaranteeing production under title III, or barter, and so forth.

Senator SCHMITT. Well, we have to be very careful about using dairy products as barter in Africa, as we discovered in the Nigerian-Biafra situation. That's something we should have remembered, and that is that there is a biological difficulty in digesting milk in most of the population of Africa.

But your point is well made. Does the authority still exist, legal authority of this kind of order?

Dr. MORGAN. Yes, sir. There's ample authority under Public Law 480, of 1954; the Agricultural Trade Development and Assistance Act. Barter is specifically mentioned in the Stock Piling Act of 1979, section 6 of which directs the President to encourage the use of barter. It is in the Commodity Credit, Corporation Charter Act. It is in the International Development Act of 1961 (sec. 502), the Foreign Assistance Act of 1974 (sec. 663), and the Federal Property and Administrative Services Act of 1949 (sec. 204 F).

Senator SCHMITT. Dr. Morgan, we appreciate your informal contributions in your draft testimony as well as the formal ones approved by OMB and the suggestions contained therein. And they were suggestions, and I frankly don't understand why OMB was so reluctant to have them presented here this morning, but they will be useful to the committee, and we understand the constraints.

It looks like a very good model that we might examine quite closely in the use of title III.

Did that complete your testimony?

Dr. MORGAN. Yes, sir.

CONSEQUENCES OF A SUPPLY CUT OFF

Senator SCHMITT. Mr. Donnelly, with our imports now totaling about 94 percent of our cobalt needs, what would be the consequence if for some reason that or a significant portion of that supply were cut off? Can you give us the scenario of events that you think would occur under such a circumstance?

Mr. DONNELLY. Yes, sir. There could be several scenarios one could apply. Assuming we were cut off—that is, there are no supplies of cobalt reaching the United States—the first thing that would have to happen would be an allocation scheme of some type, probably under title I of the Defense Production Act, which would take the cobalt remaining in the pipeline within the United States, if any, and then parcel it out to the highest priority needs.

Senator SCHMITT. And that would include what was in the stockpile?

Mr. DONNELLY. Not yet. We would invoke title I first. As that would be used up fairly rapidly. Some very hard decisions would have to be made on the 40 million pounds in the national stockpile.

Senator SCHMITT. Do you have an estimate of what is in the pipeline that constitutes sort of an indirect stockpile?

Mr. DONNELLY. No, sir; we don't have that within the Defense Department. We could obtain that for the record. The Department of Commerce maintains that information.

[The following information was received for the record:]

The Department of Commerce is unable to estimate the quantity of cobalt in the pipeline. However the Department of the Interior Bureau of Mines estimates the total domestic stocks to be 6,000,000 pounds.

Mr. DONNELLY. The amount in the pipeline obviously would rise and fall depending upon what the economic activity is in the United States. Assuming that it would be fairly rapidly used up, then we would have to address in an interagency environment what to do about the national stockpile inventories. There are 40 million pounds there now, as you are aware.

The Department of Defense obviously would require some of that cobalt. I think we would press for releases from the stockpile to support direct defense needs only, not the needs of basic industry or essential civilian needs of the economy.

That creates a——

Senator SCHMITT. No matter what the consequences on employment?

Mr. DONNELLY. Well, that is where the dilemma is, of course. Where do you draw the line between the impact on national defense versus the national security aspects? There really is no——

Senator SCHMITT. There is no line.

Mr. DONNELLY. There isn't. And there isn't a captive defense industrial base in the United States.

Senator SCHMITT. There's less than there ever was before.

Mr. DONNELLY. Well, up until recently there was a reluctance of vendors and suppliers to do business with Uncle Sam. And of course some have gone out of business entirely.

Senator SCHMITT. For a reasonably good reason.

Mr. DONNELLY. For several reasons.

Senator SCHMITT. We're a terrible client—unreliable and lots of redtape. Congress allows procurement only on an annual basis, no long-term contracts.

Mr. DONNELLY. We think we're getting to the bottom of some of those. As a staffer, I feel pretty comfortable there is some serious attention being given to trying to fix some of our industrial base problems. But this situation would require some very quick decisions on the stockpile—and it would have to happen fairly soon.

What do you do, then? If we decide to reduce stockpile inventories in peacetime what does one do if he has a military problem, and let's say 10 million pounds has been drawn down? That makes us even more vulnerable to manipulation by foreign sources.

Senator SCHMITT. A question I asked in an appropriation hearing a few weeks ago and did not receive a satisfactory answer from the Department of Defense—and I will ask again—and that is, do you consider strategic mineral vulnerability in the writing and specifications for RFP's for critical defense purposes?

Mr. DONNELLY. You may not get a satisfactory answer from me either, but I will say there is increased emphasis being given to the role of the strategic and critical materials in the acquisition process. For example we are now causing——

Senator SCHMITT. I think it is very clear, if I may interrupt, that the M-1 tank RFP specifications were not written with strategic materials in mind, right?

Mr. DONNELLY. Well, very clearly the most important part of our specs and standards is our performance rather than location of critical materials. But I will say——

Senator SCHMITT. How can it be more important if you are vulnerable to a cutoff of supply? Why do you establish that priority? It seems to me they're equally important. Both of them can shut you down.

Mr. DONNELLY. The process we have developed for acquisition of systems includes resource constraints, not only raw materials but the adequacy of our ability in the United States to process those materials through the industrial base. That is now a key part——

Senator SCHMITT. Although I think we all recognize in the back of our minds that it is not just mineral production capacity or mineral resource availability—it is your ability to refine it. And this country has been losing its ability to refine very, very rapidly. Look what's happening in the copper industry right now. That is all going abroad to Japan. That is not a very stable situation.

Mr. DONNELLY. Ferroalloys are in the same category. Much of the manufacturing capacity we have in the United States was developed during the 1950's, and that is about used up. There has not been modernization of the forging industry in particular, and the casting industry was particularly hard hit during the 1970's, as the result of a very ambitious——

Senator SCHMITT. Can DPA be used in that capacity, Dr. Morgan, to augment our refinery capacity?

Dr. MORGAN. Oh, certainly, sir. That is why I cited that definition of section 702, that "materials" includes not only raw materials but articles, commodities, products, supplies, components, technical information, and processes.

Senator SCHMITT. You think that DPA could be used to underwrite in some way or another the development of new refinery capacity under that definition?

Dr. MORGAN. Absolutely.

Senator SCHMITT. Has it ever been used in that way?

Dr. MORGAN. Oh, yes, millions of dollars were spent in the Korean war period to develop new processes.

Senator SCHMITT. New refinery capacity?

Dr. MORGAN. Yes, sir.

Senator SCHMITT. Specifically refining capacity?

Dr. MORGAN. Yes, sir. In fact, in cobalt and nickel, for the National Lead Co. working at the Madison mine, we put up a good bit of the money in the initial days for that.

And I think the best example of developing refining capacity is the titanium industry. There was no titanium industry in this country prior to the Korean war period. There is plenty of rutile and ilmenite available in the world. There is plenty of ilmenite even in this country.

So the raw material for titanium is not the problem. The question is, how do you create the refining capacity to reduce the mineral into the metal. And we initially put up $895 million in the Korean war period, which, if you looked at it today, you would have to multiply it by 3 or 4, and it would be several billion dollars, to create the titanium industry which was essentially a refining industry.

Then once we got the titanium sponge metal refined, there were questions. How do you roll it? How do you process it? It had to be done in inert atmospheres because of the oxygen contamination. How do you alloy it?

All of this was supported directly under the Defense Production Act.

Senator SCHMITT. Mr. Donnelly, we have been told by the State Department that the probability of a 1-year cut-off of cobalt from Zaire is virtually zero.

Would you care to comment?

Mr. DONNELLY. I would not want to align myself with that, particularly. Personally, I believe there is always a chance with the turmoil we have in the world today, for either one scenario or a sequential series of events that could cause a cut-off of raw material for a significant period of time. There are arguments for both sides. One can say that those lesser developed countries would have to continue to export their raw materials because they need the dollars. But it isn't always crystal clear to me that those materials would find their way to the United States. There are other scenarios that could occur in the world today that say the United States would not get those materials.

Senator SCHMITT. But even that assumes a rational sequence of events in Central Africa, and events in Africa do not necessarily correspond to what we think is a rational sequence of events, however it may correspond to what the Soviets think would be a rational sequence of events.

Mr. DONNELLY. I don't think the situation there has ever been very predictable.

Senator SCHMITT. So you don't think that our stockpile judgments should be based upon an assumption that we could not have a long-term, 1 year or so shut off of supply from Zaire or any other African source of standard slag.

Mr. DONNELLY. We believe the stockpile should be structured to support the full spectrum of potential problem areas which would include at least a 1-year interruption in supply of not just cobalt but for all the 93 materials that are in the stockpile.

BELGIUM COBALT STOCKPILE

Senator SCHMITT. The committee has also been informed that stockpiles of Zairian cobalt in Belgium exceed 1 year of Zaire's production. Is that the information you have, and are we guaranteed that this stockpile would mitigate any damage that the cut-off from Zaire would cause?

Mr. DONNELLY. The Defense Department does not maintain any independent data.

Senator SCHMITT. Mr. Campbell, do you know whether the Belgium stockpile is of that magnitude?

Mr. CAMPBELL. I don't know the magnitude. There is considerable amount of cobalt in Belgium at this time; yes. I don't know the magnitude.

Senator SCHMITT. Do we have any guarantee that that cobalt would be available to the United States?

Mr. CAMPBELL. No, sir.

Senator SCHMITT. Dr. Morgan, do you have any information about the Belgium cobalt stockpile?

Dr. MORGAN. None of this is real solid information, but it has been reported in the technical press by experts that world stocks are at least 40 million pounds, which would be about two-thirds to three-fourths of a year's total production, just where they all are isn't clear, and in the case of a commodity where the price has gone as high as $35 to $50 a pound, such material can be moved around from here to there and nobody would know where it is. I think the only thing we can really count on is what is here in the United States.

General Giuffrida earlier citied our experience in developing the cobalt-nickel deposits of Cuba. And back in the 1950s under the Defense Production Act we raised productive capacity at the Nicaro, Cuba, property owned by the U.S. Government from 30 million pounds of nickel per year to 50 million pounds. We also brought into production the Moa Bay property in Cuba at 50 million pounds of nickel and 4 million pounds of cobalt per year. In more recent years 80 million pounds of nickel and 3 or 4 million pounds of cobalt per year have all been moving to the Soviet Union because Cuba nationalized those properties in 1960.

So the only thing you can count on for sure is what's here at home.

U.S.S.R. STRATEGY

Senator SCHMITT. Mr. Donnelly, is there any doubt in the Defense Department that the Soviet Union is and has been engaged since World War II in a strategy designed to gain control over the free world's mineral sources in Africa, Southeast Asia and Latin America?

Mr. DONNELLY. I don't think there's much doubt the Soviet Union is very concerned about its welfare. They have had foreign troops on their soil in their recent history. The defense of the homeland is of paramount interest to them and; therefore, they want to structure their programs to assure an uninterrupted supply of assets to their country.

Senator SCHMITT. I don't think you answered the question. The Soviet Union is a continental power. They have geared their internal policies as near as I can tell through intelligence and independent estimates to assure that they do not have a dependency on imports of critical national materials, particularly, military materials. They haven't cared too much about others. In spite of that internal policy they have moved to try to influence and gain influence in countries producing materials they don't need, but clearly are critical to the survival of Western economies.

Now I ask you again, is there any doubt in the Defense Department that that has been the Soviet policy for several decades?

Mr. DONNELLY. I don't think the Soviet Union has changed their policies in the last 30 years.

Senator SCHMITT. They have improved their execution somewhat, though, have they not?

Mr. DONNELLY. Yes, sir; I would agree with that very definitely.

Senator SCHMITT. Mr. Krueger, do you have a comment?

Mr. KRUEGER. I think this comment in part doesn't answer your question directly, but it is clear that the Soviet Union has worked to achieve mineral self-sufficiency. They have also pursued policies around the world, which have threatened the supply of materials.

That may not have been a primary objective. Their primary objective may have been something totally different, but one of the impacts of this has been to threaten these raw material supplies.

Senator SCHMITT. What could have been any other objective they might have had?

Mr. KRUEGER. Certainly, pursuing normal foreign policy and military objectives in Africa and other areas.

Senator SCHMITT. Normal foreign policy, their normal foreign policy and military objectives, which history suggests very strongly is underlaid by a desire to be in a position to deny or at least control the source of supply of industrial materials to the Western democracies; right?

Mr. KRUEGER. I think that given their self-sufficiency, they have insulated themselves from any of these unintended impacts with regard to mineral supplies. And we are certainly more vulnerable than they are.

Senator SCHMITT. Well, if you were sitting in the Kremlin over the last 30 years, and you, and all of you, based upon your knowledge of United States and free world vulnerabilities, would you not stock minerals, such as cobalt, as one target for your foreign policy and military policy outside the bounds of the Soviet Union?

Mr. KRUEGER. If I were to put myself in that position I would say yes.

Senator SCHMITT. And that analysis is supported by the nature of Soviet and Soviet proxy involvement in certain countries, resource-rich countries and by the development for the first time in history of a Soviet blue-water navy, which has become a distinct threat to the supply lines of the free world.

Mr. KRUEGER. What I meant by some of the unintended impacts is that most of the supply disruptions that have occurred in cobalt in the last couple of years have really arisen in Angola and not in Zaire.

Senator SCHMITT. Who is in Angola?

Mr. KRUEGER. I understand, but what I'm saying is, though——

Senator SCHMITT. Say it. Cuba is in Angola, and Cuba is clearly a mercenary proxy of the Soviet Union. If anybody has any doubt about that, I would like to know it.

Mr. KRUEGER. I wasn't questioning that. I was just saying that the act, the target in this case was not Zaire or cobalt, but the action did, in fact, disrupt the supplies on both occasions.

Senator SCHMITT. Well, you're much more sanguine about what the target is than I am. I certainly would not assume that the target was not cobalt and Western World supplies of cobalt.

Mr. KRUEGER. I would defer on that judgment.

Senator SCHMITT. Well, gentlemen, we're going to have to move on.

I will ask the Department of Interior one question. What is your capacity to accelerate the assessment of the resource base in cobalt and other strategic materials available to us domestically? Mr. Miller, is that going up or down, your capacity to make that kind of resource assessment?

Mr. MILLER. Well, I hope it's going up, sir.

Senator SCHMITT. But is it? With personnel cuts and budget cuts?

Mr. **Miller**. We're not to a point, actually, where I think we can make a clear-cut statement. Certainly, that is our effort, that is our objective, but it has taken a certain amount of time through reorganization of some of the bureaus and the agencies over there to see that this is done.

Senator **Schmitt**. Since I was associated with the U.S. Geological Survey, beginning in 1959, I have seen a steady erosion of the scientific capacity of both the Survey and the Bureau of Mines to provide the kind of surveys relative to strategic mineral resource assessment and vulnerability. Do you see that it is going to be possible within your area of energy and minerals to reverse that trend?

Mr. **Miller**. Yes, sir. We have already taken the initial actions on the budget recommendations to see to it that that situation is taken care of, but it has not been implemented yet. That is my point.

Senator **Schmitt**. When do we expect to see it implemented?

Mr. **Miller**. As soon as we find out where we stand with the budget.

Senator **Schmitt**. Again, gentlemen, I will have some additional questions for the record, and we'll move on to the next witness.

Thank you very much.

[Additional material received for the record follows:]

Questions for FEMA from Senator Schmitt

Question 1. What expertise would you require to oversee a Defense Production Act contract to stimulate cobalt production?

Answer: The expertise required to oversee a Defense Production Act contract to stimulate cobalt production consists of material expertise, analytical economic capability, and Federal procurement and contractural expertise. Material expertise includes knowledge of the material processes, industrial and defense applications, industry trends, grades and forms, resources and reserves, sources of supply and stability of supply sources. Expertise in contractual law and administration, negotiations and federal procurement regulations are required to enter into and fulfill DPA contractual obligaations. FEMA has material expertise and analytical economic capability and will rely on other departments and agencies for Federal procurement and contractual expertise.

Question 2. Can you provide detailed cost estimates for the alternative methods that might be used to finance a DPA project, including hybrid proposals involving both stockpile purchases and DPA floor price?

Answer: Yes, we can. FEMA has prepared a detailed cost/benefit analysis of the alternative methods that might be used to finance a DPA project for cobalt, including hybrid proposals involving stockpile purchases and DPA floor prices. This analysis in draft form is ready for distribution to other departments and agencies for comments. When this review is completed, we will provide the Committee a copy of the report.

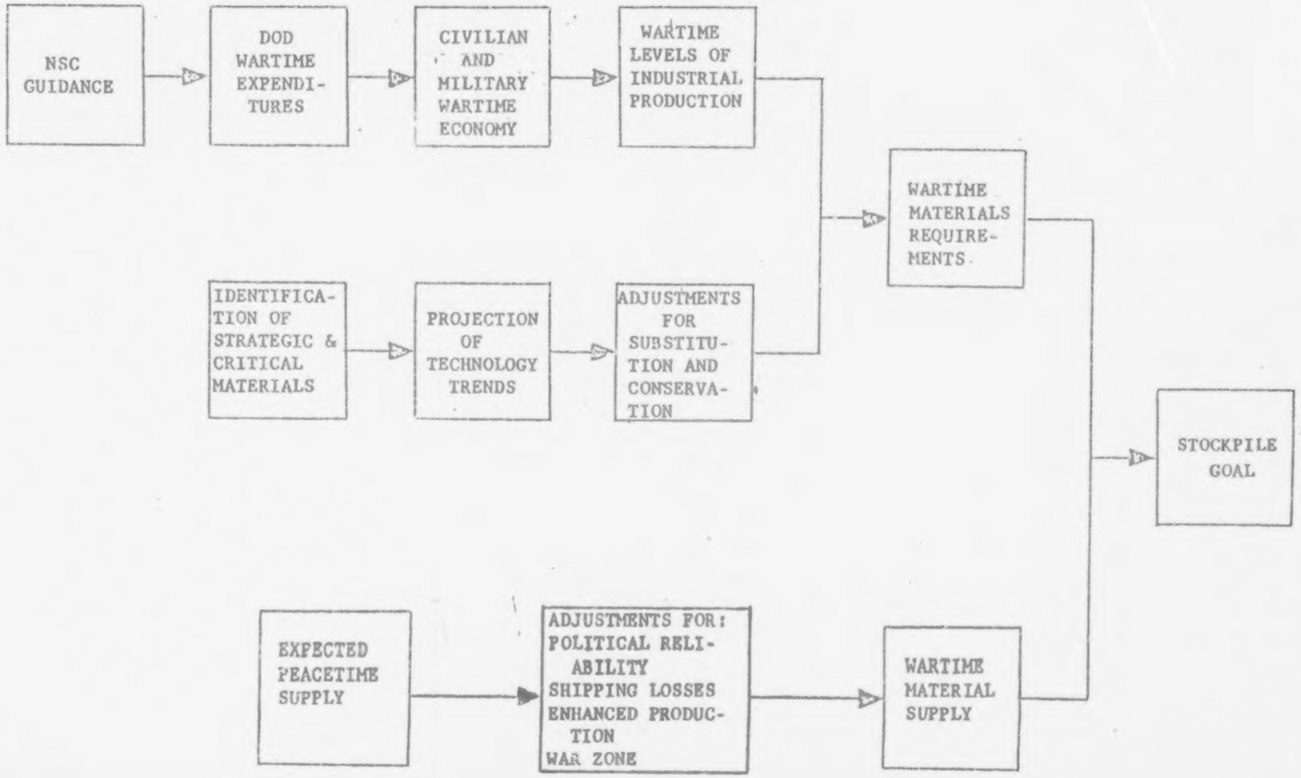
Question 3. Would you please provide for the Committee a "decision tree" describing the process by which the stockpile goal for cobalt has been established?

Answer: A "decision tree" describing the process by which the stockpile goal for cobalt has been established is shown below: (See following page.)

Question 4. If this is not also the process by which goals are established for other commodities please explain any other processes which may be used?

Answer: The process for establishing the stockpile goal for cobalt is the same as that used to set goals for other materials.

COBALT DECISION TREE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WARTIME MATERIALS REQUIREMENTS
EXPECTED PEACETIME SUPPLY
ADJUSTMENTS FOR: POLITICAL RELIABILITY SHIPPING LOSSES ENHANCED PRODUCTION WAR ZONE
WARTIME MATERIAL SUPPLY
STOCKPILE GOAL

Questions for FEMA from Senator Proxmire

Question 1. The current market price of cobalt is $17.50 per pound. Enough to encourage private enterprise to mine cobalt domestically. Fine. What you are asking Congress to do is set a floor under the cobalt market for years to guarantee a return to the companies mining cobalt. How can you justify that in the light of a 22 percent domestic reduction in domestic use of cobalt since 1978? It would appear that the price of cobalt has resulted in use adjustments and that the adjustments would continue. Wouldn't your plan encourage consumption of cobalt rather than conservation?

Answer: The FEMA-developed cobalt proposal does not ask Congress to set a floor price to guarantee a profit to cobalt producers. If the cost of production and debt servicing expenses exceed the floor price, the companies will not have a profit.

FEMA justifies the proposal in the light of reduced domestic use of cobalt because of the kinds of uses involved. Consumption of cobalt is less in nonmilitary uses such as loud speaker magnets. Use of cobalt in the next generation of civil and military jet engines, however, will be greater than in current engines. Rising fuel costs have dictated more fuel efficient designs operating at higher temperatures for which cobalt-containing super alloys are essential. These alloy uses of cobalt are not expected to decline. In fact, requirements for cobalt-containing aircraft engines and parts are expected to increase.

Many analysts believe cobalt use adjustments that could be made have already taken place. It should be noted that most of these adjustments were in the form of end product redesign such as automobile valves. The FEMA plan is not expected to encourage consumption of cobalt significantly.

Question 2. The statute provides for a stockpile to sustain U.S. needs for three years in the event of an emergency. The stockpile is now 40 million pounds. Isn't this adequate for three years for defense needs?

Answer: No. The existing cobalt inventories will provide only partial protection in the event of an emergency. The stockpile goal of 85.4 million pounds represents the shortfall of available cobalt necessary to cover the defense, industrial, and essential civilian requirements of the Nation for three years as required by the Stock Piling Act. This 85.4 million pounds is the amount needed in an emergency.

Question 3. You say that the Administration believes in the free market approach. But you say the companies mining cobalt "must foresee market conditions which lead to profitable operations." Why is cobalt different than any other materials such as coal or oil? Are not companies in the best position to judge market factors?

Answer: Cobalt is different from other materials because unlike coal, and to a lesser extent oil, the U.S. is 100 percent import dependent for cobalt. Further, cobalt production is dominated by two suppliers, Zaire and Zambia. Their production totals two-thirds to three-fourths of world production and results in significant market control. Companies are in the best position to judge market factors, and after looking at the cobalt market, have decided to stay out of cobalt production. It is their judgment that the dominance of Zaire and Zambia in the cobalt market enables these producers to control production and prices creating risks beyond the usual free market ones.

Question 4. Has the President been briefed on the cobalt subsidy plan put forward by FEMA?

Answer: No. The President will be informed of the alternatives open to the Government when the ongoing review is completed.

Question 5. Has this plan received the approval of OMB?

Answer: OMB has been informally consulted during the development of the cobalt proposal and will formally review the project when that is appropriate.

Question 6. What would be the direct dollar budget costs of this price support mechanism over the 8 year term?

Answer: The proposal calls for a combination of production incentives and stockpile purchases with budget costs ranging from $246 million to $645 million. An equivalent stockpile program, without domestic production, costs $1.1 billion.

Question 7. The FEMA plan calls for producing 7 million pounds of cobalt per year for 8 years or 56 million pounds. The calculated shortfall is 45 million pounds. Why is the production goal more than the shortfall?

Answer: The question refers to a draft plan which has been revised. The revised FEMA plan does not require stockpile purchases at any domestic production level. The revised FEMA plan separates stockpile acquisitions from domestic production incentives. The domestic production incentives portion of the revised plan obligates payment of the difference between market and floor prices (if the market price is below the floor price). Stockpile acquisitions would be made from annual appropriations. It should be noted that domestic production reduces the necessity to stockpile. For ever pound of new domestic capacity, the stockpile goal would be reduced by three pounds. Without domestic production, about 40 million pounds of cobalt would need to be purchased for the stockpile. With 5 million pounds of domestic production, only 24 million pounds would need to be purchased.

a. Will we reduce imports during this period and live off U.S. production?

Yes, domestic production is expected to result in reduced imports for comsumption.

b. If we reduce or eliminate imports, will this not drive down the price of ore from Zaire and thus increase the likelihood of subsidies in the U.S. domestic production plan?

Yes, to the extent that increased supply contributes to lower price, it could trigger the floor price mechanism. The dollar costs given in the answer to the previous question take this into account.

Question 8. Will the FEMA plan guarantee a profit for the producing companies? How will the profit level and the price level be established? Will the price of cobalt be fixed or will the price change over time?

Answer: The FEMA plan is not designed to guarantee a profit for the producers. Instead it would be designed to insulate domestic producers from potential predatory pricing on the part of foreign producers. The companies involved would have to assume the elements of commercial risk associated with any mining venture which include technological, market, and ore grade risk.

The actual price terms would be arrived at through a competitive process. Interested potential producers would respond to a proposal solicitation as in other Federal procurements. The best offer(s) would then be selected for further negotiation. Price increases will only be in accord with inflation.

DEPARTMENT OF DEFENSE

Defense Production Act and Cobalt

Question: With Zaire sitting in the middle of the volatile southern region of South Africa, do we have sufficient control of shipping lanes to ensure that our cobalt shipments will not be hampered in a time of national emergency?

Answer: Committing naval vessels to secure shipping lanes in time of potential conflict would be a problem; however, to mitigate against this, the DoD supports stockpiling or expanded domestic capabilities for those minerals or materials on which we are import dependent.

Question: It has been argued that the Soviet Union is engaged in a strategy designed to encircle and gain control of the minerals producing areas of Sourthern Africa. What is your assessment of this threat?

Answer: While the Soviets have had considerable inroads in their relations with Angola and Mozambique, the suggestion that they are engaged in a strategy of encirclement in Southern Africa for the purpose of gaining control of the mineral producing areas is somewhat simplistic. Several of the minerals producing countries in that region actually feel threatened by the Soviets and rely on the West for assistance in assuring a stable deterrent to that threat. Although Angola and Mozambique associate themselves with the Soviet Union, both nations have offered indications that they desire a better relationship with the U.S. The longer the war in Namibia continues, the further entrenched the Soviets become in Angola. A peaceful resolution to that conflict, which the U.S. has consistently supported, will contribute substantially to the stability of the overall region and thus allow the nations of that region to pursue sovereign growth and development. Zambia pursues a principally non-aligned political posture, although it is disappointing that they continue to choose to purchase arms from the Soviet Union. However, the Zambian-U.S. relationship is solid and growing. Zimbabwe is proving to be a promising relationship for the U.S. in Southern Africa. The West's aid program for economic development contributes positively to our objectives of stability in the region. Zaire is in an economically troublesome dilemma and a large part of our effort in that country is designed to foster economic reform along the lines suggested by the IMF. Zaire is wary of the Soviets and has continued to foster their relationship with the U.S. to our mutual benefit. Although a Soviet threat to the minerals producing areas of Southern Africa is not imminent, we continue to monitor the situation for signs of instability counter to our interests.

Question: Eximbank has provided well over $400 million to Zaire for the production of a 1,100 miles transmission line to the cobalt-rich Shaba Valley. Other loans to cobalt producers bring the total amount of Eximbank loans to Zaire to over $1 billion. Are we subsidizing foreign production of cobalt with these loans?

Answer: The economic aid provided to Zaire is intended to contribute to the country's overall economic development. Along with our efforts to foster economic reform in Zaire, we are designing aid to assure that Zaire can develop in such a way as to become largely independent of outside assistance. Their minerals production is a significant factor in this development and it is logical that economic growth begin there. This economic development contributes to stability which is one of our objectives in this region. Economic and political stability helps to ensure that mineral supplies important to the U.S. are not prone to disruption.

Question: IMF this summer extended a $1.1 billion loan to Zaire's ailing economy. U.S., France and Belgium recently had to reschedule payment on $3.34 billion of bilateral debt that Zaire couldn't meet this year. With an ailing economy and an unstable government, are we putting too much faith in Zaire for producing our strategic minerals?

Answer: Minerals consumed in the U.S. are procured by private corporations in a market economy. The U.S. government does not direct private firms to purchase from particular sources. Although it is unfortuante that economic reform has been slow in Zaire, Zaire's value in terms of U.S. objectives in Southern Africa goes beyond mineral markets. The U.S. will continue to foster economic reform in Zaire which in turn contributes to stability in those mineral markets in which Zaire play a major role.

Question: How long did Shaba I and Shaba II disrupt the production of cobalt in Zaire? Isn't it true that production was affected very little - and, in fact, exports in 1978 were even greater than in 1977?

Answer: Shaba I and II disrupted shipments of cobalt for only a few weeks. Without the temporary disruption caused by the Shaba invasions, we were facing increasing leadtimes and cobalt demand because of worldwide increased commercial aircraft production. This increased demand intensified the impact on the industrial community. It was early into 1980 before leadtime for cobalt products began to recede.

Question: I am informed that stockpiles of Zairian cobalt in Belgium exceed one year of Zaire's production. Wouldn't the existence of this stockpile mitigate the damage of any cutoff from Zaire that might occur?

Answer: We have no information of stockpiles in Belgium of Zairian cobalt above the normal pipeline supplies. I believe the misunderstanding of Belgium stockpiles may come from a proposal Zaire made to its customers. That proposal said Zaire would store in a bonded warehouse a quantity equal to one year's order from a customer. The proposal was made to alleviate any fears of a disruption by guaranteeing the customer one year's additional supply at all times.

Question: With military consumption of cobalt at five million pounds a year and a stockpile of 40 million pounds, it would appear that our needs during an emergency would be met for several years, enough time to bring domestic sources on-line if they are needed. Why should we go to a price fixing mechanism at this time? Wouldn't we run a risk that substitute materials development would not be encouraged?

Answer: During peacetime, direct defense consumption of cobalt represents about 15 percent of total U.S. consumption. In the event of a major 3-year war, defense requirements for cobalt would be 55 percent of total U.S. requirements. The stockpile currently holds around 40 million pounds of cobalt (approximately 1.5 year's consumption in wartime rates). With leadtimes of 2-3 years to bring domestic sources on-line, it seems imperative to either fill the stockpile goal or bring domestic mines into operation as soon as possible.

Question: During a national emergency or cutoff of supplies, why not drawdown the cobalt stockpile and replenish it later - isn't that exactly why we have a stockpile?

Answer: Commodities in the National Defense Stockpile are to be used to supply the military, industrial and essential civilian needs of the U.S. for national defense in the event of a national emergency. The stockpile is not to be used for economic or budgetary purposes.

Question: Does the DoD take an official position on the FEMA subsidy program for critical materials?

Answer: The DoD is not aware of a subsidy program for critical materials. However, the DoD has supported FEMA's proposal to use the DPA to stimulate the domestic production of natural rubber (guayule), cobalt, titanium and refractory bauxite. These materials are critical to our defense industrial base. Presently, there is limited or no domestic production of these materials.

Question: How many potential sources of cobalt are there in the U.S.? (a) Have you examined the environmental damage that would result from the start-up of these sources? (b) Would an EIS be required for start-up of cobalt production under the DPA?

Answer: DoD has been contacted by three potential sources of cobalt in the U.S. Two of these could be in production within 18 to 24 months. Any start-up of cobalt production from these sources would be regulated by existing environmental standards.

Question: If this is a national security matter, why should not any costs incurred under the DPA subsidy of cobalt production be borne by the DoD?

Answer: The Department of Defense is responsible for the national defense; however, the total national security is the responsibility of all government agencies. Title III of the DPA, Expansion of Productive Capacity and Supply, applies to any authorized federal agency such as Defense, Energy, Commerce, etc., which is engaged in procurement for the national defense. Each agency is authorized by law to use any funds which have been, or may be, appropriated or allocated to it.

Question: How would Zaire react if the U.S. begins domestic production of cobalt?

Answer: It is impossible to predict how any producer of materials will react to additional competition. However, if the U.S. were to guarantee a domestic cobalt program to establish a production source for the national security and foreign sources undercut the domestic price we would still receive benefits of increased employment, GNP and domestic independence from foreign imports.

Question: Would they (Zaire) lower prices to the point that Zaire could put domestic producers out of business?

Answer: With a guaranteed price under Title III of the DPA, predatory pricing would not force the domestic companies to close-down.

Question: How well did the allocation system work during the Zaire disruption?

Answer: In 1978, when cobalt was allocated, particularly due to the Shaba invasion, DoD contracts rated under the authority of Title I of the DPA received the needed quantities of cobalt.

General Services Administration
Federal Property Resources Service Washington, DC 20406

DEC 7 1981

Honorable Harrison Schmitt
United States Senate
Washington, DC 20510

Dear Senator Schmitt:

In response to your letter of October 29, 1981, concerning the Senate Banking Committee hearing of the Defense Production Act and cobalt, the enclosed information is provided. Questions are answered in the order in which they appear on the enclosure to your letter.

Please contact me if additional information is needed.

Sincerely,

ROY MARKON
Commissioner

Enclosure

Enclosure to GSA Letter dated

1. Question: Is the stockpile being used as a budget balancing tool?

Answer: Public Law 96-41 states in Section 3 paragraph (b) (1) "The purpose of the stockpile is to serve the interest of national defense only and is not to be used for economic or budgetary purposes."

2. Question: (a) Why did we sell the cobalt? (b) Was it used to reduce the deficit? (c) Why was it sold below Zairian prices? (d) What is the reason for a strategic stockpile; is it for defense purposes, or economic?

Answer: (a) Under the Strategic and Critical Materials Stock Piling Act, the President shall determine which materials are strategic and critical, and the quality and quantities of such materials which shall be stockpiled under the Act. By Executive Order 12155 of September 10, 1979, the President has delegated to the Federal Emergency Management Agency the authority to determine which materials are strategic and critical and how much should be in the stockpile.

The stockpile objectives or goals for cobalt from 1944 to date have been as shown below:

Stockpile Objectives:

November 20, 1944	11,600,000 LB
February 18, 1949	40,000,000 LB
June 29, 1950	74,000,000 LB
November 9, 1950	71,000,000 LB
October 9, 1952	71,000,000 LB
September 28, 1954	95,710,000 LB
March 15, 1955	129,000,000 LB
June 30, 1958	81,400,000 LB
November 4, 1959	19,000,000 LB
April 10, 1964	42,000,000 LB
March 27, 1969	38,200,000 LB
April 12, 1973	11,945,000 LB

Stockpile Goal:

October 1, 1976	85,415,000 LB
May 2, 1980	85,400,000 LB

As provided in the Strategic and Critical Materials Stock Piling Act, the General Services Administration (GSA) was directed to manage the stockpile purchasing, storing, rotating strategic and critical materials, and disposing of excess materials which are no longer needed because the objective or goals are revised.

In 1966, GSA had in storage approximately 102 million pounds of cobalt metal. This inventory consisted of approximately 26 million pounds of material that was acquired under the Defense Production Act (DPA), plus approximately 77 million pounds that was acquired under the Strategic and Critical Materials Stock Piling Act (SCM) and the supplemental stockpile established by Section 104(b) of the Agricultural Trade Development and Assistance Act of 1954 together. With an objective of 42 million pounds, (established April 10, 1960) GSA was holding approximately 60 million pounds of cobalt in its inventory that were excess to the approved goals as of that date. GSA requested and obtained on August 23, 1966, authority to dispose of approximately 25 million pounds of excess cobalt from the inventory. This material was disposed of by sale under Invitation for Bids (IFB) or Solicitation of Offers between 1966 and 1976.

In 1970, after disposing of approximately 24 million pounds of the DPA inventory, there remained an excess in the SCM inventory of approximately 39 million pounds of cobalt. On March 27, 1969, the objective was reduced to 38.2 million pounds. GSA requested authority from Congress to dispose of this excess material and was granted the authority by Public Law 91-317 dated July 10, 1970. This material was disposed of by IFB or Solicitation of Offers during the period of 1970 to 1976.

(b) See Question (3) and (4) below.

(c) The prices obtained for the DPA and SCM inventories of cobalt were current market prices for the quality of cobalt disposed of by GSA. The material was sold under sealed bids to the highest acceptable bidders or was offered under Solicitation of Offers at fair market prices established by GSA.

(d) The specific reasons for a stockpile is best stated in the Strategic and Critical Materials Stock Piling Act (50 U.S.C. 98-98h). Prior to the 1979 amendment a portion of this law states, "... the natural resources of the United States in certain strategic and critical materials being deficient or insufficiently developed to supply the industrial, military, and naval needs of the country for common defense, it is the policy of the Congress and the purpose and intent of this Act to provide for the acquisition and retention of stocks of these materials and to encourage the conservation and development of sources of these materials within the United States, and thereby decrease and prevent wherever possible a dangerous and costly dependence of the United States upon foreign nations for supplies of these materials in times of national emergency."

3. Question: Were the cobalt proceeds from these sales deposited into the Stockpile Transaction Fund?

Answer: No, the Stockpile Transaction Fund was established by Public Law 96-41 on July 30, 1979, and did not exist at the time of the previous cobalt sales.

4. Question: Were they used for stockpile purchase or were these funds turned over to the Treasury Department?

Answer: Proceeds from the cobalt sales of stockpile material were deposited into miscellaneous receipts, and DPA material sales proceeds deposited into the "DPA" revolving fund.

5. Question: Recent purchase of 5.2 million pounds of cobalt had a quality grading of 99.65 percent purity. How would you rate this with the cobalt already in stock?

Answer: The material being added to the stockpile is considered of the highest quality required to meet current material specifications.

6. Question: Will this older cobalt need to be replaced?

Answer: The decision has not been made at this time. The Federal Emergency Management Agency is responsible for determining the quality of stockpile materials.

Any decision to replace the existing inventory should take into consideration the following:

(a) All users of cobalt do not require material of the highest purity.
(b) Material sold from the stockpile has been used by 40 to 50 firms in the United States.
(c) The material can be blended with high purity material and used by many firms.
(d) The material is usable by many firms after relatively simple furnace operation.

7. Question: ... Will AMAX, ... be able to process stockpiled cobalt rapidly enough to meet our needs in time of national emergency?

Answer: AMAX did not offer to supply cobalt to meet stockpile specification in response to our Solicitation Number GS-D00xx-81C-0001. Existing stockpile material can be used by the majority of consumers in its present form. The blending or relatively minor processing would not result in undue processing demand.

8. Question: How long will it take for the cobalt in the stockpile to be refined?

Answer: No decision has been made to refine the material (See answers to questions 6 and 7 above).

9. Question: Where is our cobalt presently stored?

Answer: Davisville, Rhode Island; Somerville, New Jersey; Binghamton, New York; Romulus, New York; Scotia, New York; Curtis Bay, Maryland; Point Pleasant, West Virginia; Mechanicsburg, Pennsylvania; Hammond, Indiana; New Haven, Indiana; Ravenna, Ohio, and Warren, Ohio.

10. Question: Are there any transportation problems associated with quickly moving a vast quantity of cobalt from its storage area to the processing site in a time of national emergency?

Answer: No

11. Question: ... why did the stockpile contain such a large quantity of this undesirable grade of cobalt and does the stockpile now possess any materials that are not of the desirable stockpile grade?

Answer: First, the cobalt mentioned was not in the National Defense Stockpile. The sub-specification material was part of the Defense Production Act Stockpile. Second, the material in our National Defense Stockpile was acquired to meet specifications that were not as strenuous as the specifications are today (See answers to Question 6 and 7).

12. Question: During 1969 and 1976 why were we selling cobalt at below market rate?

Answer: Cobalt was sold at the market rates in effect at the time taking into consideration the material quality and market conditions.

13. Question: What are the possibilities of mining the seabed for the manganese nodules which may also contain substantial quantities of cobalt? For how long could these manganese nodules meet U.S. cobalt needs?

Answer: The possibility of recovering cobalt from seabed nodules appears potentially promising. However, two items are currently impeding the development of seabed mining: 1) The lack of a "Law of the Sea" which would define the areas which could be mined by various countries and 2) The lack of development of economical recovery techniques.

The United Nations Conference on the Law of the Sea met in August 1981, but no final treaty emerged from the conference. Deliberations are scheduled to resume in the spring of 1982. On June 28, 1980, the Deep Seabed Hard Mineral Resources Act (PL 96-283), permitting U.S. companies to commence commercial mining after January 1, 1988, for cobalt-bearing manganese nodules was signed into law.

A study prepared by the U.S. Department of the Interior in 1976 estimated that the cobalt reserves from seabed mining should be on the order of 500 billion pounds of contained cobalt. Even taking account of probable low recoveries and yields there would be sufficient cobalt reserves from this source to meet world demand into and possibly through the 21st century.

DEPARTMENT OF THE INTERIOR

Questions from Senator Schmitt:

1. What is your Cabinet Council going to recommend to the President with regard to Title III of the Defense Production Act?

The Administration recognizes that Title III of the Defense Production Act could, in some cases, be more cost-effective than stockpiling, in that creation of one ton of new annual domestic productive capacity reduces the need for a stockpile by three tons. The Administration is committed to a policy of maximum use of market forces to reach national stockpile goals. Consequently, the Cabinet Council as of the date of the hearing was still carefully considering the matter and no final resolution had as yet been proposed to the President.

2. Eximbank has provided well over $400 million to Zaire for the production of a 1,100-mile transmission line to the cobalt-rich Shaba Valley. Other loans to cobalt producers bring the total amount of Eximbank loans to Zaire to over $1 billion. Are we subsidizing foreign producers of cobalt with these loans?

If the U.S. is a major contributor of funds to Eximbank and the loans are at below market interest rates, we are in effect subsidizing the foreign producers of cobalt with these loans. In the case of the Inga-Shaba power line, we are in effect subsidizing State-owned cobalt production because loan repayment by the State does not show up as a cost of that production.

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HOWARD A. MENELL, MINORITY STAFF DIRECTOR AND COUNSEL

United States Senate
COMMITTEE ON BANKING, HOUSING, AND
URBAN AFFAIRS
WASHINGTON, D.C. 20510

October 29, 1981

Dr. Michael R. Foose
Cobalt Commodity Geologist
U.S. Geological Survey
12201 Sunrise Valley Drive
Reston, VA 22092

Dear Dr. Foose:

Again I would like to thank you for your participation in the Senate Banking Committee hearing on the Defense Production Act and cobalt held on October 26. Your testimony has been very helpful to this Committee as we begin to form conclusions on how best we may resolve this nation's dependence on foreign imports of strategic materials.

I mentioned in the hearing that there would be additional questions for the record. We would appreciate a prompt response to the questions that are enclosed so that we may close the record and submit it for publication.

Sincerely,

Harrison Schmitt

Geological Survey Questions

1. What degree of self sufficiency does the Soviet Union have in cobalt?

United States Department of the Interior
GEOLOGICAL SURVEY
RESTON, VA. 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-Mail Stop 112

DEC 2 1981

Honorable Harrison Schmitt
United States Senate
Washington, D.C. 20510

Dear Senator Schmitt:

As a followup to the October 26 hearing on cobalt at which Dr. Michael Foose of the U.S. Geological Survey (USGS) testified, you requested that Dr. Foose provide an answer to the following additional question. "What degree of self-sufficiency does the Soviet Union have in cobalt?" Our answer is derived mostly from a 1979 report prepared by the West German Bundesanstalt fur Geowissenschaften and Rohstoffe.

The U.S.S.R. has cobalt reserves and resources that exceed 350,000 tons of metal. Their annual consumption of cobalt was, in 1977, about 4,500 tons. Virtually all of this material was refined at smelters within the Soviet Union. However, only about 1,900 tons of this cobalt was obtained from domestic mine production. Most of the remaining cobalt (1,200-2,250 tons) was imported from concentrates shipped from Cuba. A small amount (660-700 tons) of cobalt was obtained from a variety of other unspecified countries.

The U.S.S.R. thus obtains about 40% of its cobalt from internal sources while nearly all of the remaining cobalt is derived from a country (Cuba) that is directly under their control.

During the discussion at the October 26 hearing, you also had a question concerning geologic work near the Black Hawk District (Bullard Peak area) in New Mexico. The USGS is presently completing a regional geologic study of the Silver City 2° sheet which encompasses the Bullard Peak Region. A geologic map of the Bullard Peak area has recently been completed (Hedlund, D. C., 1980, Geologic map of the Redrock NE Quadrangle, Grant County, New Mexico; USGS MF-1264) and a final mineral resource appraisal of the entire Silver City sheet is in progress.

We regret the delay in responding to your request. Your letter was sent directly to Dr. Foose who was conducting field investigations in northern

Georgia for three weeks, so it remained unopened for that period. We appreciate this opportunity to assist your committee in its deliberations. Please do not hesitate to call on us for further information.

Sincerely yours,

Dallas L. Peck

Director

OFFICE OF THE DIRECTOR

March 3, 1849

United States Department of the Interior

BUREAU OF MINES
2401 E STREET, NW.
WASHINGTON, D.C. 20241

December 4, 1981

Honorable Harrison Schmitt
United States Senate
Washington, D.C. 20510

Dear Senator Schmitt:

Thank you for your letter of October 29, 1981, to Dr. John Morgan, requesting answers to questions concerning cobalt. We appreciate your kind words on the testimony given by Dr. Morgan.

Responses to the questions submitted for the record from you and from Senator Proxmire are enclosed.

Please let us know if we can be of further assistance.

Sincerely,

Robert C. Horton
Director

Enclosures

1. Your bureau estimated that the U.S. consumption of cobalt dropped 6% to 17.6 million pounds in 1980. What does the bureau attribute this drop to? Will the decrease of cobalt use continue?

   Answer: Final Bureau of Mines statistics indicate that U.S. apparent consumption was 17.1 million pounds in 1980, a decrease of about 9% from the 18.8 million pounds consumed in 1979. Data through the first half of this year suggest consumption will further decrease to between 13 and 15 million pounds for 1981. Even the superalloy sector, in which cobalt use grew in 1979 and 1980, is showing a significant weakening in 1981. The decline in cobalt utilization in all its important applications, specialty alloys, certain types of steels, cutting and wear-resistant materials, and catalysts, was a result of the generally low levels of industrial activity throughout the domestic economy. Substitution and conservation efforts, stimulated by high cobalt prices in 1979 and 1980, have also been effective in certain uses, particularly in the magnetic alloy field. A continued softness in the economy could result in further reductions in cobalt consumption next year, but probably not below a base level of 12 to 14 million pounds per year.

2. The Bureau of Mines has also estimated that the global cobalt production rose about 25% to 59.6 million pounds in 1980, up from 48.2 million pounds in 1977. Zaire's output has increased about 50% in that time to about 33 million pounds. With such increases in the world and particularly Zaire, might we expect lower prices for cobalt?

   Answer: World cobalt mine output has increased from 47.4 million pounds in 1977 to an estimated (revised) 65.9 million pounds in 1980. Output in 1981 will probably decrease to about 60 million pounds due to production decreases in response to an oversupplied market. Zairian output has increased from about 22.4 million pounds in 1977 to an estimated 34.2 million pounds in 1980; reportedly Zaire has cut output this year. In the last 2 years, plans have been announced to increase production capacity in Zaire, Zambia, and Canada. Some of this expansion may be curtailed pending recovery of world cobalt demand. The soft market has seen the major producer's price for cobalt decline from $25 to about $17 per pound this year. Currently, the spot price is around $10, decreasing from $18 to $20 at the start of the year. If the market surplus continues, and producers do not react by implementing further output reductions, both the producer and spot prices could be expected to decrease further. As a lower limit, the price probably would not fall below the $6 to $7 per pound range, the levels prevailing in late 1977 and early 1978 before prices escalated to the $25 level. In general, the cobalt price should respond to the supply/demand balance. Given the current conditions of oversupply and the existence of sufficient capacity to supply expanded demand, and barring unforeseen output interruption, it does not appear that cobalt prices will escalate in the near term (the next 2 to 3 years) to any substantial degree.

3. As I understand it, 6% of our cobalt consumption last year came from recycled materials. Is it possible to increase the use of cobalt that is recycled?

   Answer: About 1.2 million pounds of cobalt, or 7% of apparent consumption, was reported in 1980 as consumed from purchased scrap. This is likely a minimum figure because not all firms which might recycle cobalt in its various forms are canvassed. A reasonable estimate for total recycled cobalt is 10% to 15% of domestic demand. Possibilities exist for increased recycling, primarily for cobalt used in superalloy, cemented carbide, and catalyst applications. Some firms are currently studying the economics of large-scale programs to recover cobalt and other metals from petroleum catalysts or the regeneration of these catalysts. Although much of the cobalt consumed is in dissipative uses, possibly 20% to 25% of overall demand could be met by secondary production, assuming such recovery is cost effective.

4. How many mining projects have been brought on stream through incentive programs under Title III of the DPA?

Answer: Certainly hundreds and probably thousands of mines were created or sustained by Title III, but there is no way to determine the number because many of the programs were contingent purchase guarantees ("we will buy it if you can't sell it elsewhere"). Under such contingent guarantees material produced was commonly sold to meet industrial requirements and was only acquired by the Government when the market price declined below the guaranteed contract price. For example, in the broad domestic tungsten program the guaranteed price was set at $63 a short ton unit, while the official Government ceiling price was set at $65 - and much material moved directly to industry. Several such programs, including columbium, tantalum, manganese, and mica, provided for purchase of foreign material in addition to domestic. Some expansion programs as in the case of nickel and titanium provided for the Government to pay for the cost of facilities. Other contracts in the case of several materials were purely for research services - the main product purchased being information. Still others provided matching funds for exploration of mineral deposits - again information was the product being purchased. Major new domestic metal mines were covered by specific contracts, but many more small mines participated in the 8 Depot Programs, and over 1,000 deposits were involved in the DMEA program. In the listing below the term "covered" embraces the quantitative aspects of all of the forms of Title III assistance just enumerated. The term "valued" means the quantity times the price. The term "PUNC" means probable ultimate net cost - a phrase of art first utilized in the first amendments to the Defense Production Act which provided that "when any contract, agreement, loan, or other transaction heretofore or hereafter entered into pursuant to section 302 or 303 imposes contingent liability upon the United States, such liability shall be considered for the purposes of sections 3679 and 3732 of the Revised Statutes, as amended, as an obligation only to the extent of the probable ultimate net cost to the United States under such transaction." The quantitative totals, the value totals, and PUNC (or in certain cases profit) are taken from the "Final Report on Borrowing Authority" submitted to the Congress pursuant to Section 304(b) of the Defense Production Act, as amended, by the General Services Administration, dated September 30, 1974.

MAJOR METALS

Aluminum: The aluminum metal expansion program covered 3,336,000 s. tons of aluminum valued at $1,520,313,000 (profit $15,399,000). In making aluminum it takes 4 tons of bauxite (the ore of aluminum) to make 2 tons of alumina (an intermediate) to make 1 ton of aluminum metal. Consequently, these multiples of alumina and bauxite were also covered by the program. The only specific bauxite contract covered 1,900,000 long dry tons of Jamaican bauxite valued at $25,383,000 (PUNC $4,596,000). Contracts covered Alcoa, Kaiser, Reynolds, and Harvey.

Copper: The copper metal expansion program covered 1,312,092 s. tons of copper valued at $717,895,000 (PUNC $87,453,000). Contracts covered Duval Sierrita, San Manuel, National Lead, White Pine, Banner, Copper Range, Asarco, Anaconda, Copper Cities, Copper Creek, Miami, North Butte, Phelps Dodge, Howe Sound, Riviera, Appalachian Sulphide, Rhodesian Congo Border Power, Inco, Campbell Chibougamau, Falconbridge, and several small mines.

Nickel: The nickel metal expansion program covered 915,138,000 lbs of nickel valued at $765,470,000 (PUNC $92,832,000). Contracts covered Hanna (still in operation at Riddle, Ore.), Freeport, Inco, National Lead, Nicaro, Moa Bay, Falconbridge, East Rim, Milnet.

Cobalt: The cobalt metal expansion program covered 53,110,607 lbs of cobalt for $108,504,000 (PUNC $14,119,000). Contracts covered Freeport, National Lead, Calera, Falconbridge, African Metals, and Rhodesian Congo Border Power Corp. (details of each are provided in Dr. Morgan's statement).

Tin: In Alaska U.S. Tin Corp. was loaned $2,887,000 (PUNC $2,470,000), but the bulk of the tin came from abroad from the R.F.C. and the Texas City tin smelter: 172,815,985 lbs at $176,610,000 (PUNC $1,585,000).

Titanium: The $229,945,000 titanium metal expansion program (PUNC $129,232,000) while creating the domestic titanium industry: DuPont, Cramet, TMCA, Dow, Electro-Met, Horizons, National Research, Wah Chang, also stimulated rutile and ilmenite mining and the manufacture of the intermediate titanium tetrachloride.

Molybdenum: A major domestic expansion resulted from two contracts with Climax which originally covered 131,320,000 lbs but most of the material was resold (PUNC $237,000).

Lead-Zinc: Relatively minor contracts totalled 43,858 s. tons of lead and 61,737 s. tons of zinc.

Other DPAct Contracts: Covered bismuth, cryolite, dolomite, fluorspar, graphite, magnesium, rutile, selenium.

THE 8 DEPOT PROGRAMS

To encourage production by small miners with deposits of insufficient size and unknown grade precluding negotiation of specific contracts, several general buying programs were set up whereby at specific depots the U.S. Government paid relatively high prices for strategic material delivered meeting specified schedules of grades and prices.

Manganese: Depots included Butte-Phillipsburg, 346,541 s. tons for $11,210,000 (PUNC $6,187,000); Deming, 312,806 s. tons for $12,319,000 (PUNC $7,907,000); Wenden, 391,777 s. tons for $10,959,000 (PUNC $6,508,000); Mexico, 336,000 s. tons for $7,670,000 (PUNC $6,355,000); Domestic Small Producers, 708,412 s. tons for $71,865,000 (PUNC $48,620,000). Major manganese contracts included 6,160,000 s. tons from Amapa, Brazil, for $231,097,000 (PUNC $4,705,000) and 896,639 s. tons from Manganese Inc. for $68,976,000 (PUNC $19,780,000).

Chromite: (Financed under Stock Piling Act) domestic depots purchased 200,000 long tons of chromite for $18,588,036. The major DPAct contract covered 900,000 s. tons from the American Chrome Co. in Montana for $33,861,000 (PUNC $26,758,000).

Tungsten: Depots purchased 47,529,979 lbs of domestic origin for $189,799,000 (PUNC $67,867,000). 41,551,686 lbs were also purchased from foreign producers for $179,346,000 (PUNC $59,382,000).

Mica: Depots purchased 25,000 s. tons of domestic hand-cobbed mica for $35,499,000 (PUNC $35,491,000). 3,262 s. tons of quality mica were also purchased from foreign producers for $24,699,000 (PUNC $7,806,000).

Mercury: Depots offered to buy up to 125,000 flasks of U.S. mercury valued at $28,141,000. Actual purchases totalled only 26,891 flasks for $6,066,000 (profit $12,000). The government also offered to buy up to 75,000 flasks of Mexican mercury for $16,887,000 but only 3,274 flasks were purchased for $749,000 (no profit or PUNC).

Columbium-Tantalum: Depots offered to buy up to 15,000,000 lbs of combined columbium-tantalum pentoxides world-wide. 11,247,149 lbs were purchased for $67,373,000 (PUNC $26,763,000). An additional 2,415,653 lbs were purchased abroad for $13,056,000 (PUNC $7,449,000). Porter Bros. domestic mine also yielded 752,078 lbs for $6,626,000 (PUNC $4,950,000).

Asbestos: Depots purchased 2,350 s. tons of domestic chrysotile for $2,145,000 (PUNC $1,726,000).

Beryl: Depots purchased 4,500 s. tons of domestic beryl ore for $2,560,000 (PUNC $825,000). 312 s. tons of foreign beryl were also purchased for $111,000 (PUNC $42,000).

EXPLORATION

Domestic exploration was furthered through the Defense Minerals Exploration Administration (DMEA) which put up 75% of the costs of exploring for highly strategic minerals and 50% of the costs for certain others. DMEA had 3,888 applications; of these 1,159 were granted participation contracts covering 29 minerals, aggregating $57,295,000 (PUNC $51,805,000)

5. Of these cases how many projects were discontinued after Title III incentives were terminated?

   Answer: Many of the major mines that were brought into production by contracts continued in operation after the contracts came to an end and many of these are still producing today. However, most of the smaller mines that participated in the 8 Depot Programs closed when those support programs came to an end.

6. What were the conditions leading to the discontinuance of the Blackbird project in the 1950s? What is to keep this from happening again?

   Answer: Increased availability of lower-cost foreign material caused the Calera (Blackbird) and Fredericktown (Madison) operations to close when the Title III contracts were fulfilled. Such would undoubtedly happen again if foreign material were to be available at lower prices, but domestic properties could be put into standby status for reactivation in a future emergency, thus continuing to reduce the need for stockpiles even though the domestic properties were not actually producing all the time.

7. What are the possibilities of mining the seabed for the manganese nodules which may also contain substantial quantities of cobalt? For how long could these manganese nodules meet U.S. cobalt needs?

Answer: Several international mining consortia have spent considerable capital in the last 10 years or more on exploration of seabed nodule resources and for testing of recovery systems. The prime mining area has been identified (eastern tropical Pacific), but much more work is apparently required to develop efficient recovery and processing techniques. Future metal markets must be continually reassessed and economic profitability proven before the large investments needed can be justified. Moreover, there are the international problems of ownership and licensing authority, which are currently being debated at periodic sessions of the United Nations Law of the Sea (LOS) Conference. In 1980, the U.S. Congress passed the Deep Seabed Hard Mineral Resources Act (PL 96-283), unilaterally establishing the vehicle for current issue of exploration licenses and for commercial mining after 1987.

Despite the economic and jurisdictional uncertainty, there is some industrial consensus that technological problems can be solved and that commercial mining of seabed nodule mining could be initiated possibly in the 1990's. After 2000, if several hypothetical nodule mining operations are active, the cobalt recovered could supply a large share (greater than 50%) of forecasted domestic requirements. This source would be available for at least several decades.

8. Recent imports from Zaire for the first half of the year were considerably down. For example, the total Zairian imports were 282,000 pounds compared to 6,360,000 pounds of total imports. Why is this and where are our other imports coming from?

Answer: For January through August 1981, cobalt imports directly from Zaire amounted to 285,000 pounds, or 3.6% of the 7.8 million pound total. For comparison, during 1980 Zaire supplied 6.2 million pounds (38%) of the total 16.3 million pounds imported domestically. In addition, imports from Belgium-Luxembourg, which originate in Zaire, are also down from the 1980 level. The large decrease in Zairian exports to the United States is presumably due to the relatively high price being asked. The Zairian producer price for cobalt has been well above the spot, or market, price all year. Also, other world producers have been reportedly selling at closer to the lower spot price. With demand down and plentiful supplies, domestic consumers have apparently switched to other sources for cheaper cobalt. Imports have decreased appreciably from last year, with Canada, Japan, Zambia, Norway, and Finland capturing a larger share of the U.S. market. The Japanese cobalt originates largely from the Philippines and Australia and the Norwegian cobalt originates in Canada.

9. Do you think that the companies who are interested in cobalt production will go ahead on their own without government action? Why is this so?

Answer: With vacillating defense requirements, spot cobalt prices in the vicinity of $10 per pound, substantial producer inventories overhanging the market, and lower-cost sources abroad, domestic cobalt production from mines devoted primarily to cobalt per se would appear to be unattractive absent some form of contingent guarantee as was used under Title III in the Korean War period.

10. Are there any other very high priority commodities where Title III programs would be appropriate? Can you expand upon this?

Answer: In the hearings on Strategic Minerals and Materials Policy held by the Subcommittee on Energy and Mineral Resources, Committee on Energy and Natural Resources, U.S. Senate, on April 9, 1981 (page 90), Mr. Paul J. Krueger, Assistant Associate Director for Resources Preparedness, Federal Emergency Management Agency stated "Stockpiling is only one method of ensuring that materials will be available during an emergency. Development of a domestic capacity to produce strategic and critical materials is an alternate method. One of the purposes of the Defense Production Act is to expand "productive capacity and supply beyond the levels needed to meet the civilian demand, in order to reduce the time required for full mobilization." Title III of that act authorizes the use of Government loans, loan guarantees, purchase commitments, guaranteed production levels and guaranteed prices to achieve these goals. My office has under active consideration four projects to expand the domestic capacity to produce cobalt, guayule, which is a source of natural rubber, titanium, and refractory bauxite." More currently, as noted in my prepared statement of October 26, 1981, "We are currently evaluating the costs, benefits, and other issues associated with Title III. As you may know the Administration's economic, tax, and regulatory reforms will place capital-intensive industries in a much better competitive position than previously. Although Title III may provide one way of meeting stockpile goals and otherwise improving our readiness posture, it does involve intervention in the market place. This runs counter to the Administration's policy. Analyses completed to date of the use of Title III versus stockpile purchases are inconclusive. We will continue to review this question, but for now the Administration does not favor the use of Title III."

11. Eximbank has provided well over $400 million to Zaire for the production of a 1,100 mile transmission line to the cobalt rich Shaba valley. Other loans to cobalt producers bring the total amount of Eximbank loans to Zaire to over $1 billion. Are we subsidizing foreign producers of cobalt with these loans?

Answer: To the extent that interest charges are lower than going commercial rates in the Unites States, such lower rates can clearly be considered as a subsidy. However, it should be noted that the U.S. Government pursues multiple objectives including expanding sales abroad of U.S. manufacturers, diversifying sources of strategic materials, and encouraging friendly developing nations.

Zaire's mineral industry provides that country with more than half of its foreign exchange earnings. The copper mines, important as copper producers, also provide byproducts--cobalt, cadmium, germanium, selenium, zinc and most of the silver. Shaba is the Province where all the mines producing the above metals are located. In view of this, the loans given to Zaire are for maintaining the health of the economy of Zaire which is so dependent on Shaba's mineral production. We understand also that the industry has expansion plans for the copper industry. This would mean additional power requirements which can be supplied from the Inga power station once the transmission system in Shaba is completed. As the copper industry is maintained productive and viable, cobalt production will benefit. With a viable and efficient copper industry, Zaire is capable of producing half the world's cobalt requirements at a lower price than any other world producer.

Questions for Bureau of Mines from Senator Proxmire

1. **What surge capacity do Zambia, South Africa, and Botswana have?**

   Answer: Current annual cobalt production capacity in Zambia is estimated at 8 million pounds. Projects have been announced which could bring Zambian capacity to nearly 18 million pounds per year by 1985; however, poor market conditions may curtail the expansion projects. Two firms in the Republic of South Africa have expanded cobalt capacity recently. In the next year or two, these firms may be producing 600,000 to 1 million pounds of cobalt in sulfate or metal each year. In Botswana, recent modification of a major nickel-copper-cobalt smelter could possibly increase the country's cobalt output in matte from about 600,000 pounds to over 800,000 pounds per year. For comparative purposes, current world mine output capacity is estimated in the 60 to 70 million pound-per-year range, about half of which is in Zaire. Of the three countries in question, only Zambia could be considered a major producer currently.

2. What stockpiles of cobalt are held by the other major powers: USSR, France, Germany, Great Britain?

   Answer: France, the Federal Republic of Germany, and Great Britain have no cobalt mine reserves and are entirely dependent on imports for supplies. France does have a national strategic stockpile, but we do not know what amount of cobalt it contains, or what plans there might be for acquisition. According to reports, there has been governmental consideration of stockpile programs for cobalt in Japan, the Federal Republic of Germany, and Great Britain, but apparently nothing has been implemented. In the USSR, military plans call for a stockpile of strategic minerals equal to 3 years consumption. With consumption at approximately 10 million pounds per year, the stockpile is probably 30 million pounds.

3. **What are the prospects of opening up new international sources of cobalt supply such as the Peoples Republic of China?**

   Answer: New sources of cobalt or significant output from countries other than those presently producing are not likely for at least the next 5 years. In the longer term, countries with significant nickel-cobalt laterite resources (New Caledonia, the Philippines, Indonesia, and others) may become larger producers and cobalt from seabed nodules may be exploited after 1990. The People's Republic of China has been very active in its search for domestic strategic metals. Apparently there are several cobalt deposits in China. Cobalt was only recently announced as available for export sales.

4. Are there reserves of cobalt in Canada or Mexico?

Answer: Canada is a cobalt producer (about 5% of world mine output in 1980) and has significant reserves, mostly associated with nickel sulfide deposits. At current production levels, Canadian reserves are probably sufficient for 20 to 30 years of continued output. Further exploration could outline additional mineable ore. Mexico has no cobalt reserves and is not expected to be a significant producer in the future.

5. What percentage of U.S. cobalt reserves can be extracted economically at the current world price of $25 per pound? At $50 per pound?

Answer: The United States has no reserves of cobalt at the current producer list price of about $17 per pound and the spot market price of about $10 per pound. According to a recent Bureau of Mines report on the availability of domestic cobalt resources, about 192 million pounds of cobalt would be economically recoverable at a price of $25 per pound, and a price of $1 per pound for byproduct copper and 40 cents per pound for byproduct lead. This would be 27% of the estimated 700 million pounds of the domestic reserve base. No analysis was made for the $50 per pound price level. The basic problem in developing these resources is the uncertainty that a relatively high market price can be sustained over the period of time necessary to recover the invested capital. Given the high capital costs of constructing a mine and refinery, mining firms must be reasonably assured of a future market at some minimum price in order to project a profitable operation. At this time, the cobalt market is weak, world capacity is sufficient to supply higher levels of demand, and producer prices are likely to decline further from the approximate $17 per pound now prevailing.

6. With the price of cobalt jumping from $6.85 in 1978 to $17.50 today, why has this not been enough of an incentive for U.S. mining companies to invest their own dollars and re-enter the market?

Answer: It takes many years for a mine to be developed including ancillary smelting and refining facilities. Mines are not normally developed in response to short period surges in spot prices. The U.S. Government recently sold 30-year bonds that yield a guaranteed return of over 14% with no risk. With vacillating defense requirements and cobalt supplies currently available at spot prices of about $10 per pound, mining companies apparently do not consider domestic cobalt production sufficiently attractive.

Senator SCHMITT. Our next witness. Dr. William Owczarski, manager of technical planning, Pratt & Whitney Aircraft Group, Hartford, Conn., and you are accompanied by someone.

STATEMENT OF DR. WILLIAM OWCZARSKI, MANAGER OF TECHNICAL PLANNING, PRATT & WHITNEY AIRCRAFT GROUP, HARTFORD, CONN., ACCOMPANIED BY TERRENCE BRACY, CONSULTANT TO PRATT & WHITNEY AIRCRAFT GROUP, FORMER ASSISTANT SECRETARY OF TRANSPORTATION

Dr. OWCZARSKI. Mr. Chairman, I'm accompanied by Mr. Terrence Bracy, a consultant to Pratt & Whitney Aircraft and a former Assistant Secretary of Transportation.

Mr. Chairman, and members of the committee, thank you for the opportunity to be here today to present Pratt & Whitney Aircraft Group's views on the subject of cobalt, its importance to our country and our company.

I am Dr. William A. Owczarski, manager of technical planning for Pratt & Whitney Aircraft Group, a unit of the United Technologies Corp. We are the world's largest producer of jet engines, and use more than 10 percent of the cobalt consumed in the United States annually. Cobalt, along with titanium, chromium and tantalum, are absolutely essential for the production of both military and commercial jet engines. These materials alone possess the strength, lightness and heat resistance needed to build reliable, powerful and efficient engines. The materials have been termed "strategic" in part because they are imported from unfriendly or unstable nations. As implied in the term, there is a vulnerability to potential supply disruptions that we as a nation, an industry, and a company must face.

COBALT CRISIS OF 1978

We are all aware of the cobalt crisis which occurred in 1978. It was a year marked by very high demand, for both military and commercial aircraft. Zaire, producer of 55 percent of the world's cobalt, set supply allocations for its major customers that year at 70 percent of 1977 levels. The market disruption which followed had dramatic and unfortunate results. Prices and production leadtimes tripled.

The cobalt crisis of 1978 is a lesson in the delicacy of the world strategic minerals market. On May 15, 1978, there was an insurgent attack on Kolwezi in the Shaba Province of Zaire. While the net effect of the rebel activity was to close the mines for only a few weeks, the lack of sound information, and the absence of domestic sources, caused a bidding war for cobalt that led to the threefold increase in price. Complicating the picture was U.S. Government stockpile policy. The 1978 disruption was preceded by a decade during which the U.S. Government disposed of approximately 6 million pounds of cobalt per year from our national stockpile. This amount represented one-third of the total U.S. consumption and must have substantially suppressed the rate of production in that decade. But at the time of our greatest need, the stockpile door was closed.

During the crisis, Pratt & Whitney Aircraft worked on many fronts to insure the availability of cobalt to meet our business requirements. We supported our vendors' efforts to procure cobalt and we worked hard to reduce our need for cobalt. Where possible, alternative materials have been substituted. Through advanced manufacturing technology, a major effort was launched to reduce input raw material weights by what we call "near net shape" processing. We have begun new efforts in recycling machining chips back to our vendors' starting material. These initiatives, to date, have reduced our use of cobalt by approximately 20 percent to build our jet engines. Research has also targeted future materials and processes that will further reduce critical material and cobalt content. But we will always need cobalt to produce a worldwide competitive product.

The cobalt crisis which started in 1978 lasted about 2 years. By early 1980, there were indications that the prices of cobalt were softening and that availability was much easier. Today, there are substantial surplus stocks at the producers and prices are sinking. The quoted producer price is about $17 per pound down from a peak of $25. The spot market price is below $11 per pound down from a high of nearly $50. The current situation is comfortable but we should not be lulled into complacency.

As long as we are dependent on Zaire for a major portion of our cobalt supply, and other distant vulnerable sources for other critical materials, the danger of short-term supply interruption will be ever present. Even a short-term disruption would have a serious effect on our ability to produce and support military and commercial requirements for jet engines and spare parts. Over the long term, it is very likely that normal economic forces will procure adequate supplies of cobalt in the market. Therefore, the real need, as we see it, is for protecting America from the impact of short-term supply cutoffs.

Senator **Schmitt**. Why do you assume normal economic forces are going to operate in the world where the Soviet Union does not have to play by the same economic game that we do?

Dr. **Owczarski**. Although we believe the duration of any future supply cutoff would be short term, this does not mean we're not concerned about the situation. We recognize that under present circumstances even a short-term interruption in our cobalt supply could have serious consequences. Because of our concern, we've undertaken efforts on numerous fronts to minimize the effects of a supply cutoff. For example, as I've already mentioned, we've reduced our requirements for cobalt by about 20 percent through R. & D. efforts, improved manufacturing technology and conservation measures. On the legislative front, we've worked hard to assure that the Idaho and California sources of cobalt would not be locked up by wilderness proposals but instead remain open and accessible for mineral development. In addition, both Harry Gray, chairman of the board and chief executive officer of United Technologies Corp., and Alexander Haig, former president of UTC, have testified before Congress on this matter pointing out our concerns and stating our support for various programs we believe are essential in attacking the problem.

Senator SCHMITT. Well, you'd better start thinking about it, because the other part of that history we have already discussed, and that is that the Soviets are moving into more and more of a controlling position relative to sources of cobalt and other strategic materials. And so far, we have not developed a foreign policy capable of countering that movement.

I say you just can't pull down the blinders and put on the earmuffs and say you don't have to worry about foreign policy. Your stockholders wouldn't like to hear that, because it is foreign policy that's going to affect your supply, not economic policy.

Dr. OWCZARSKI. Shall I continue? I'm not sure I can answer that question.

Senator SCHMITT. Well, you might mention it to your superiors then and see if they have an answer. Go ahead.

Dr. OWCZARSKI. The most obvious answer is a stockpile of sufficient size and quality to cover potential emergency periods. The United States has a national defense stockpile which was created after World War II to provide a protection against material shortages in a national emergency. The stockpile is currently based on retaining a 3-year supply of materials. A complementary concept to the stockpile is the development of domestic resources, the subject of today's hearings. Stimulation of domestic production can complement the function of a stockpile to the degree that for every pound of domestic cobalt produced annually, 3 pounds less are required in the stockpile.

The Defense Production Act title III authority is a mechanism which has proved effective in the past in developing and expanding U.S. mineral production. It provides a broad range of options by which Government can encourage production. We are not prepared to discuss or recommend specific types of DPA authority that could or should be utilized. From our perspective as a user, we do not feel that we are expert in those areas of mineral production which you may consider or take action on in these hearings. Instead, we assume that the producers that are interested will provide you with information to help you to determine the merits of domestic production options.

HEAD-IN-THE-SAND ATTITUDE

Senator SCHMITT. It seems to me that's a head-in-the-sand attitude. You should be discussing and trying to influence public policy that affects the health and strength of your industry, the employment of your workers and your contribution to the national security, as well as the commercial plant and equipment. I just find it incredible that you would say that it is not really your interest.

Dr. OWCZARSKI. Mr. Chairman, P. & W. A. is very much interested in this problem. We believe that domestic production of cobalt is important and that DPA title III authority should be examined closely to determine the most efficient and cost-effective methods of achieving this goal. We have not yet had the opportunity to examine the proposals of the mining companies associated with the California, Idaho, and Missouri deposits and therefore cannot address specific approaches to the use of title III authority. We look forward to hearing the comments of the Anschutz, Noranda, and

Cal Nickel representatives scheduled to appear later today and would be happy to discuss our analysis of their proposals with you at some future time.

Senator SCHMITT. I would think you would want to be as expert as anybody else on what DPA options might be best for the country and for the national defense, the economy, and your own corporate interest. I just find it a little bit amazing that you would not have yet developed an expertise that could contribute to this national discussion of the use of the Defense Production Act.

Dr. OWCZARSKI. I think we are certainly working at that and are trying to get in that expertise.

Let me spend a few moments addressing the stockpile itself. Revision of the stockpile philosophy and management is also necessary. As a protection against supply interruptions, the current stockpile has some large and dangerous holes. Inventories and goals are woefully out of balance. There are serious doubts about the quality of the existing cobalt in the stockpile, because it was purchased more than 20 years ago. Technical advances of the last two decades have probably made this material unusuable for the production of today's sophisticated and advanced jet engines without significant reprocessing. GSA officials have stated few, if any, records exist to document the quality of the currently held material. As a general rule, turnover of stockpiled materials is essential to assure that in times of need these items meet current technical specifications.

Materials supply systems rarely operate without peaks and valleys. They can be compared to hydraulic systems. As with a hydraulic system, a reserve or accumulator is needed to take up the surges of uneven flow. The accumulator in this analogy is the stockpile itself. When times are slow, material from the system should flow into the accumulator or stockpile. When needs are great, the stockpile should be able to provide material. The mechanisms for doing this must be carefully considered and at times great judgment and wisdom would be required.

Senator SCHMITT. In hydraulic systems do you not there define a minimum quality in the accumulator that is necessary for the efficient operation of that system?

Dr. OWCZARSKI. That is correct. In an engineering system.

Senator SCHMITT. So you would want to do the same in your analogy of using the stockpile as an accumulator for materials?

Dr. OWCZARSKI. That is correct.

Senator SCHMITT. Do you think that minimum quantities should be a 3-year supply?

Dr. OWCZARSKI. A 3-year supply is certainly a good place to start as a size for the national stockpile.

Senator SCHMITT. But you would let it oscilate above that at some point. Would you let it oscilate around a 3-year supply, say, down to 2 and up to 4 or 5, or what?

Dr. OWCZARSKI. Depending upon the specific conditions, there are going to be points in time when you either buy or sell from the stockpile, which will cause it to deviate from a 3-year supply. I don't know that we can define what the minimum is or what the maximum would be.

Senator SCHMITT. But you would define that on the basis of other considerations; right? If your domestic production capacity started to rise, then 3 years—the 3-year supply to make up the shortfall would be a smaller amount of cobalt than it would in a time when you had no domestic supply; is that correct?

Dr. OWCZARSKI. I think that domestic supply would certainly be one parameter in the equation to define the size of the stockpile.

Senator SCHMITT. There are many others, on the vulnerability of your foreign supplies, your sea lanes, and so forth. And what you really need is some real time capacity to evaluate all these parameters and adjust as appropriate the target, the actual quantitative target, in the stockpile.

Dr. OWCZARSKI. We would certainly support this kind of thinking within the structure of the management of the stockpile.

Senator SCHMITT. Please go ahead.

Dr. OWCZARSKI. In fact, to be effective, the management of the stockpile must be independent of the political pressures which have plagued it in the past. We believe the stockpile should be handled by an independent management with characteristics similar to the Federal Reserve Board. From this posture, the stockpile could be managed in best interests of the Nation, without regard to the demands of special interests.

As I have already stated, title III of the Defense Production Act can be an effective part of the solution. The relationship between DPA title III authority and stockpile policy and operations must be closely reviewed to assure that the two programs are working toward the same objective. Other interrelated actions must be taken, including a national materials policy, a balanced approach to land use, continued and increased R. & D., conservation, and scrap reclamation.

Mr. Chairman, no single piece of legislation, or executive action, will provide an immediate answer to our heavy reliance on foreign sources of cobalt and other strategic and critical materials. The problem is complicated and has been ignored for too long. Certainly, part of the answer lies in the subject of today's hearings—the production of domestic supplies. Another obvious step is National Defense Stockpile management reform. Indeed, out of your deliberations may come additional ideas and new approaches.

Pratt & Whitney Aircraft is pleased that the committee is taking a hard look at a very tough problem. We congratulate you and your staff on your efforts. We hope our comments have been helpful in dealing with your task, and we look forward to your legislative recommendations. We will also continue to be of whatever assistance we can to this committee.

I will be happy to answer any questions you have at this time. Thank you.

[Complete statement of Mr. Owczarski follows:]

Statement Of
Pratt & Whitney Aircraft Group
United Technologies Corporation

Mr. Chairman and Members of the Committee, thank you for the opportunity to be here today to present Pratt & Whitney Aircraft Group's views on the subject of cobalt, its availability and its importance to our country and our company. I am Dr.William A. Owczarski, manager of technical planning for Pratt & Whitney Aircraft Group, a unit of the United Technologies Corporation. We are the world's largest producer of jet engines, and use more than 10% of the cobalt consumed in the United States annually. Cobalt, along with titanium, chromium and tantalum, are absolutely essential for the production of both military and commercial jet engines. These materials alone possess the strength, lightness and heat resistance needed to build reliable, powerful and efficient engines. The materials have been termed "strategic" in part because they are imported from unfriendly or unstable nations. As implied in the term, there is a vulnerability to potential supply disruptions that we as a nation, an industry and a company must face.

We are all aware of the cobalt crisis which occurred in 1978. It was a year marked by very high demand, for both military and commercial aircraft. Zaire, producer of 55% of the world's cobalt, set supply allocations for its major customers that year at 70% of 1977 levels. The market disruption which followed had dramatic and unfortunate results. Prices and production lead times tripled.

The cobalt crisis of 1978 is a lesson in the delicacy of the world strategic minerals market. On May 15, 1978, there was an insurgent attack on Kolwezi in the Shaba Province of Zaire. While the net effect of the rebel activity was to close the mines for only a few weeks, the lack of sound information, and the absence of domestic sources, caused a bidding war for cobalt that led to the three-fold increase in price. Complicating the picture was U.S. Government stockpile policy. The 1978 disruption was preceded by a decade during which the U.S. Government disposed of approximately six million pounds of cobalt per year from our national stockpile. This amount represented one-third of the total

United States consumption and must have substantially supressed the rate of production in that decade. But at the time of our greatest need, the stockpile door was closed.

During the crisis, Pratt & Whitney Aircraft worked on many fronts to ensure the availability of cobalt to meet our business requirments. We supported our vendors' efforts to procure cobalt and we worked hard to reduce our need for cobalt. Where possible, alternative materials have been substituted. Through advanced manufacturing technology, a major effort was launched to reduce input raw material weights by what we call "near net shape" processing. We have begun new efforts in recycling machining chips back to our vendors' starting material. These initiatives, to date, have reduced our use of cobalt by approximately 20% to build our jet engines. Research has also targeted future materials and processes that will further reduce critical material and cobalt content. But we will always need cobalt to produce a worldwide competitive product.

The cobalt crisis which started in 1978 lasted about two years. By early 1980 there were indications that the prices of cobalt were softening and that availability was much easier. Today there are substantial surplus stocks at the producers and prices are sinking. The quoted producer price is about $17.00 per pound down from a peak of $25.00. The spot market price is below $11.00 per pound down from a high of nearly $50.00. The current situation is comfortable but we should not be lulled into complacency.

As long as we are dependent on Zaire for a major portion of our cobalt supply, and other distant vulnerable sources for other critical materials, the danger of short-term supply interruption will be ever present. Even a short term disruption would have a serious effect on our ability to produce and support military and commercial requirements for jet engines and spare parts. Over the long term, it is very likely that normal economic forces will produce adequate supplies of cobalt in the market. Therefore, the real need, as we see it, is for protecting America from the impact of short-term supply cut-offs.

The most obvious answer is a stockpile of sufficient size and quality to cover potential emergency periods. United States has a National Defense Stockpile which was created after World War II to provide a protection against materials shortages in a national emergency. The stockpile is currently based on retaining a three year supply of materials. A complementary concept to the stockpile is the development of domestic resources, the subject of todays hearings. Stimulation of domestic production can complement the function of a stockpile to the degree that for every pound of domestic cobalt produced annually, three pounds less are required in the stockpile.

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Let me spend a few moments addressing the stockpile itself. Revision of the stockpile philosophy and management is also necessary. As a protection against supply interruptions, the current stockpile has some large and dangerous holes. Inventories and goals are woefully out of balance. There are serious doubts about the quality of the existing cobalt in the stockpile because it was purchased more than 20 years ago. Technical advances of the last two decades have probably made this material unusable for the production of today's sophisticated and advanced jet engines without significant reprocessing. GSA officials have stated few, if any, records exist to document the quality of the currently held material. As a general rule, turnover of stockpiled materials is essential to assure that in times of need these items meet current technical specifications.

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In fact, to be effective, the management of the stockpile must be independent of the political pressures which have plagued it in the past. We believe the stockpile should be handled by an independent management with characteristics similar to the Federal Reserve Board. From this posture the stockpile could be managed in the best interest of the nation; without regard to the demands of special interests.

As I have already stated, Title III of the Defense Production Act can be an effective part of the solution. The relationship between DPA Title III authority and stockpile policy and operations must be closely reviewed to assure that the two programs are working toward the same objective. Other inter-related actions must be taken including a national materials policy, a balanced approach to land use, continued and increased R&D, conservation and scrap reclamation.

Mr. Chairman, no single piece of legislation, or executive action, will provide an immediate answer to our heavy reliance on foreign sources for cobalt and other strategic and critical materials. The problem is complicated and has been ignored for too long. Certainly, part of the answer lies in the subject of today's hearings -- the production of domestic supplies. Another obvious step is Defense Stockpile management reform. Indeed, out of your deliberations may come additional ideas and new approaches.

Pratt & Whitney Aircraft is pleased that the Committee is taking a hard look at a very tough problem. We congratulate you and your staff on your efforts. We hope our comments have been helpful in dealing with your task and we look forward to your legislative recommendations. We will also continue to be of whatever assistance we can to this Committee.

I will be happy to answer any questions you have have at this time.

Thank you.

Senator SCHMITT. Thank you.

Could you supply for the committee any details that you might have worked out or might work out on the independent management of the stockpile you mentioned on page 4 of your statement?

Dr. OWCZARSKI. We have formulated some ideas and would be more than happy to submit those to you separately in writing.

Senator SCHMITT. I think it would be helpful to have them.

Does Pratt & Whitney invest or support the education of engineering and science students in universities throughout the country?

Dr. OWCZARSKI. Does it support them?

Senator SCHMITT. Yes. Do you have an arrangement? Do you contribute to scholarship programs? Do you have arrangements for assisting in the payment of faculties' salaries?

How deeply involved is Pratt & Whitney and United Technologies in general in the support of private education in scientific and technical matters?

Dr. OWCZARSKI. I'm not familiar with the details of all of our activities. I do know that we support activities in this area. For example, we are supporting the Manufacturing Science Center at the Rensselaer Polytechnic Institute, but I'm not familiar with the broad scope.

Senator SCHMITT. Maybe you could supply a summary of that for our record.

In particular, whether or not Pratt & Whitney ever looks at the second level of human resource, and that is the scientific capability for mineral exploration and production, the mining schools and economic geology schools in the country.

Dr. **Owczarski**. I would have to look at that.

Senator **Schmitt**. I'm curious as to how deeply the concern of Pratt & Whitney and United Technologies is for the accelerating shortfall in the production of young men and women with advanced degrees in science and engineering and, in particular, as it relates to your direct needs and to the indirect needs of providing the resources that you depend upon.

Dr. **Owczarski**. This would be a corporatewide activity. I'll have to get that information and supply it for the record.

Senator **Schmitt**. That would be very helpful.

We appreciate your testimony this morning, and we may have a few other questions later.

[The following was received for the record:]

As a high technology company UTC relies on educational institutions to provide talented people schooled in a diversity of disciplines who can meet the manpower needs of a growing corporation. Accordingly, support for higher education is the top priority of UTC's $7.8 million corporate contributions program for 1981.

Over $2.2 million has been allocated this year for educational institutions from coast-to-coast, with primary emphasis on those colleges and universities which are considered UTC's best recruiting sources. Specifically, these contributions are intended to encourage and support increased student participation in engineering and the physical sciences, to promote basic research in areas of particular interest to the company, to provide improved opportunities for continuing education for UTC employees and to foster minority and female participation in engineering and the sciences.

These grants take many forms, from scholarship support [1] to building funds for laboratory and library construction. They range in size from $100 to the Milwaukee School of Engineering to $750,000 to the University of Hartford used to build the Engineering Building at the University of Hartford. There are over 80 institutions which will receive contributions from UTC this year. Naturally the larger grants are paid out over several years, but to give an idea of the breadth and depth of this program, the following are a sampling of major UTC commitments: $740,000 to Rensselaer Polytechnic Institute; $500,000 to the University of Illinois; $250,000 to Louisiana State University; $100,000 to the University of Rochester; $225,000 to the University of Florida; $40,000 to Florida Institute of Technology; and $100,000 to the University of Bridgeport.

In addition to these direct grants, the United Technologies Matching Gift program, which provides a 2-for-1 match to employee gifts to educational institutions, will account for another $1,000,000 in direct support for higher education.

Mr. **Bracy**. Mr. Chairman, could I just make a comment to reiterate Pratt & Whitney's role in the materials issue. It has been a role of very strong advocacy for the last 2 years. In fact, the major problem that erupted after the supply interruption of 1978 was the identification of domestic sources.

And what Dr. Owczarski and others discovered in their investigation was that the two principal sources—or two of the principal sources; namely, in Idaho, the Blackbird Mine and, in California, the California nickel deposit, were both on Federal lands and were subject to specific action and limitations under wilderness provisions.

This company worked very, very closely with the potential producers there and with the various Senators and Members on the Hill to see that those restrictions were lifted. That was principal.

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[1] UTC contributes to the National Merit Scholarship Program, the National Fund for Minority Engineering Students and the United Negro College Fund.

And second, the leadership of United Technologies—indeed Mr. Gray, who is the chairman of the board, and Secretary Haig, who was then president of the company, spent an awful lot of time on Capitol Hill trying to raise the visibility of the strategic minerals issue.

So that our feeling here today that we are not expert in the particular mechanics that you may choose under DPA is not an expression of any lack of support, but only our interest in hearing what the outcome of this very important hearing is. And we would like to work with you.

Senator SCHMITT. Well, thank you, sir. And I hope that one of your more significant contributions to this problem has been the delivery of Secretary Haig down here to us for a while.

Certainly the very prompt action to defer consideration of the draft law of the sea treaty was a very important initial contribution that the Secretary made. And I'm looking forward to more on this subject.

Thank you, gentlemen.

Our next panel will deal with the producing side of the question of cobalt, Mr. Richard Fiorini, vice president and general manager of Noranda Mining, Inc., of Salt Lake, and Mr. Charles Melbye, president of Anschutz Mining Corp. of Denver.

And we will also place in the record at the conclusion of your statements the statement of William Hosken, president of the California Nickel Corp.

Please, Mr. Fiorini, would you begin.

STATEMENT OF RICHARD J. FIORINI, VICE PRESIDENT AND GENERAL MANAGER, NORANDA MINING, INC., SALT LAKE CITY, UTAH

Mr. FIORINI. Yes; Mr. Chairman, and members of the committee, I am Richard J. Fiorini, vice president and general manager, Noranda Mining, Inc., with headquarters in Salt Lake City.

Noranda employs about 8,000 workers in the United States in the fields of mining, forest products, and manufacturing.

I have submitted a written statement for the record, which I will summarize in my remarks. I would ask that that written statement be included in the record.

Senator SCHMITT. It will be.

Mr. FIORINI. Since 1979, Noranda has been involved in rehabilitating and expanding the Blackbird Cobalt Mine near Salmon, Idaho. Thus far the company has invested more than $35 million in the mine. And the exploration and rehabilitation, mill testing, water treatment, and general cleanup—the total estimated cost of this project, if it goes ahead, is in excess of $230 million.

Senator SCHMITT. That is prior to production?

Mr. FIORINI. Yes.

We appreciate the committee's interest in using Government purchase contracts under title III of the Defense Production Act to develop the domestic capacity in cobalt.

The importance of cobalt to an adequate defense industrial base for the United States has been studied extensively over the past several years. And strong support exists in Congress and several executive branch agencies for using DPA contracts of domestic producers to insure the United States a secure source of cobalt.

The United States presently imports 95 percent of its cobalt supplies, 76 percent of which come from two African countries, Zaire and Zambia. Internal instability and the possibility of military conflict with their neighbors make these two countries a highly insecure source of cobalt for the United States.

As recently as 1978, an invasion of the cobalt mining areas of Shaba Province in Zaire resulted in a curtailment of mineral output and a rationing of the available cobalt supply. During this period, the producer price increased from $5 to $25 a pound and the spot price reaching $50. The present market price for cobalt is approximately $15.

I would like to bring the committee's attention to last Thursday's Wall Street Journal article, in which North Korea is buying 2 million pounds of cobalt from Zaire, at a price of $18.25.

Senator SCHMITT. $18.25?

Mr. FIORINI. Yes.

Senator SCHMITT. How do you explain that price, in light of the spot price of $11?

Mr. FIORINI. I don't really know. It's my understanding, actually, that the sales that are going on at $11 are fairly small sales, that the official African producer price is still $17.25.

Senator SCHMITT. Now, is this Korean purchase, as you understand it, for stockpiling there or for use in their industry?

Mr. FIORINI. It is a very short article, and I will just read it to you. It says:

> North Korea to Buy Cobalt from Zaire. North Korea will take delivery of 1,000 tons of cobalt from Zaire in December according to diplomatic sources. The sources base their informatin on correspondence between Zaire's Mineral Marketing Board and the North Korean Embassy.

It says that correspondence indicates that North Korea will pay the equivalent of about $18.25 U.S. per pound. That's all it says.

Senator SCHMITT. Thank you.

Mr. FIORINI. The defense stockpile of cobalt, which was recently supplemented by the purchase from Zaire of 5.2 million pounds for $78 million is still 40 million pounds below its goal of 85 million pounds.

We recognize and support the administration's commitment to free market economics. However, free market conditions do not exist in the production and sale of cobalt.

Zambia and Zaire presently produce over 60 percent of the world supply. And since cobalt is a byproduct of their copper mines, there is little relationship between their price for cobalt and the cost of operation.

PREDATORY PRICING

In addition, loans provided by the International Development Banks, the Eximbank, and the U.S. Overseas Private Investment Corporation had subsidized the capital cost of the African mines, so that pricing competition with potential U.S. mines is not based on the free market. In effect, cobalt supply and prices are controlled by a small number of foreign countries who use predatory pricing to destroy competition from potential U.S. mines.

The risk of predatory pricing could be eliminated by contingent purchase contracts between the Government and domestic producers. Such contracts which are authorized by the Defense Production Act could provide that if the price of cobalt falls below the price necessary to sustain U.S. production, the Government would purchase cobalt for the stockpile from domestic mines at a price specified in the contract.

DPA contracts were used extensively during the Korean war to develop or expand U.S. mining capacity in copper, iron ore, lead, zinc, manganese, nickel, magnesium, titanium, and cobalt.

By using contracting techniques to limit the Government's exposure, the Government was able to generate secure domestic sources in these minerals at a cost of less than one-tenth the face amount of the contracts.

Blackbird Mine, which Noranda is currently rehabilitating, was placed in production during the Korean war through the use of the Defense Production Act contract. Blackbird Mine, together with mining that's been developed in Missouri and California, could produce 8 million pounds of cobalt per year by 1985. This would meet over 40 percent of the total U.S. demand and 100 percent of the demand for superalloys, which are used in the defense application. Blackbird alone could produce 3.7 million pounds of superalloy cobalt a year.

Without considering the additional discoveries occurring at or near the mine site, these discoveries plus those occurring in other States could ultimately result in U.S. self-sufficiency in this important metal.

At present, the geological ore reserves at Blackbird total 4,750,000 tons. These reserves are located within a cobalt belt occurrence about 30 miles long, which runs in a northwesterly direction on both sides of the Blackbird property.

Noranda is confident that several times the proven ore reserves are present and will be found within the cobalt belt.

In addition, the Congress approved legislation in 1980, Public Law 96-312, authorizing exploration for cobalt in a special mine management zone in the River of No Return Wilderness Area, near the Blackbird Mine. Initial field surveys have confirmed the presence of cobalt mineralization in that zone.

The mine at Blackbird is now permitted to produce concentrates of up to 300 tons of ore per day. Noranda is also developing a process for refining cobalt concentrates into a high grade cobalt metal to meet requirements for high temperature and strength alloys.

We have rejected existing processing methods which involve the roasting board because of environmental considerations. Instead, we have been doing extensive testing of hydrometallurgic process which involves high temperature and pressure, using reagents to dissolve cobalt into solution for later electrowinning into pure cobalt metal.

If it were possible for the Blackbird Mine to be put into operation, approximately 630 jobs would be created, 450 at the mine mill and 180 at the refinery. These jobs would be particularly important for the state of Idaho, where some 2,000 miners are presently unemployed due to depressed market conditions in the mining industry and the closing of mines for environmental problems.

NECESSARY GOVERNMENT CONTRACT

Without the assurance of a Government contract, it will be necessary for Blackbird to be closed, with further unemployment occurring. Should there later be a disruption in the supply of cobalt from foreign sources, a 3- to 4-year period would be required to place this project into operation.

Two methods basically exist.

Senator SCHMITT. Excuse me, sir. How much longer will you continue your restoration activities without assurance of Government contracts?

Mr. FIORINI. Our plan at the present time, Senator, is try to continue into the summer of 1983--pardon me, 1982. And at that time we will try to make a determination how this will be going for the support of domestic cobalt. And if it doesn't look that favorable, we will be shutting down.

Two methods exists for assuring the United States an adequate supply of cobalt: Additional purchases for the stockpile——

Senator SCHMITT. Excuse me, again.

Would you be asking—assuming that there was no contract forthcoming—would you be asking, though, that some assistance, in minimizing the deterioration of the property at the point where you leave it from the Government?

Mr. FIORINI. What we will have to do, Senator, we are involved at the present time in the middle of an environmental impact statement. We do have a water treatment plant and so forth that are operating there. I think, yes, that there could be discussions that will be going on. We would like to continue to operate that water plant and try to keep some of the underground operation open.

Senator SCHMITT. Is it your understanding that there is sufficient authority under DPA for the Government to assist you in that maintenance operation? Should the contract not be forthcoming?

Mr. FIORINI. It's my understanding that there is the authority. The money seems to be the big problem and the appropriations.

Senator SCHMITT. I understand. But if the authority is for helping you stockpile the mine, so to speak, at that point in its rehabilitation——

Mr. FIORINI. I am just not sure, Mr. Chairman, just exactly what authority.

Senator SCHMITT. Could you check into that for the committee and see if your counsel believes that the Government does have such authority?

Mr. FIORINI. Yes; I surely will.

Senator SCHMITT. Your know, they have that authority for military plants that go out of operation. They can assist in the stockpiling of the tooling and things like that. And I just question whether that applies to mining properties as well.

Mr. FIORINI. We will check into it.

The purchases of cobalt for the stockpile would have an immediate impact on the Federal budget and outlays. To meet the stockpile goals for 85 million pounds, the Government would need to purchase an additional 40 million pounds. At the current world market price of $15 a pound, the budgetary impact and actual cash outlay would be $600 million.

Further, assuming a 15-percent interest rate on Government borrowing to make the purchases, the total cost to the Government to hold the cobalt for 10 years would be $1.5 billion.

Properly formulated, EPA contracts with domestic cobalt producers could cost significantly less than purchases to fill the stockpile. Indeed, the cost would be zero if the world price of cobalt did not fall below the price negotiated in the contract.

An immediate cost advantage of a DPA contract is that 1 pound of annual domestic cobalt capacity reduces the stockpile goal be 3 pounds. This formula is based on the fact that stockpile goals are determined on the basis of the amount of material needed to sustain a 3-year war. Thus, 8 million pounds of domestic cobalt capacity would reduce the cobalt stockpile goals by 24 million pounds.

With respect to the budget, the principal advantage of a DPA contract is that outlays and, therefore, any potential increases in the deficit would not occur until the fiscal year in which production begins.

In the case of the cobalt mines now being rehabilitated in the United States, the first budget outlay would not occur until fiscal year 1986.

Moreover, outlays would be spread over the 8 to 10 years of the contract. And the total amount of the outlays could be limited by placing a cap on the Government's contractual obligation.

In conclusion, by using contracting authority under the Defense Production Act, the U.S. Government can develop a domestic capacity for the production of cobalt that will assure the country a secure source of supply of a mineral vital to the development of military surge capacity, reduce stockpile goals for cobalt, and protect U.S. industry from OPEC-type cartel activities, provide employment in the depressed U.S. mining industry, and improve the U.S. balance of payments.

Through the use of contract provisions to limit the exposure of the Government, these benefits can be attained at a cost that is less than the cost of filling the cobalt stockpile, and with the impact, if any, on budget outlays and the Federal deficit not occurring until fiscal year 1986.

For these reasons, we believe the Congress and the administration should support the DPA contracting for the development of the domestic cobalt capacity.

Thank you, Mr. Chairman. That concludes my statement.

Senator SCHMITT. Thank you.

[Complete statement of Mr. Fiorini and his answers to some additional written questions follow:]

Statement by

RICHARD J. FIORINI

VICE PRESIDENT AND GENERAL MANAGER
NORANDA MINING, INC.

Mr. Chairman and Members of the Committee:

I am Richard J. Fiorini, Vice President & General Manager of Noranda Mining Inc., with headquarters in Salt Lake City, Utah. Noranda employs about 8,000 workers in the United States in the fields of mining, forest products and manufacturing.

Since 1979, Noranda has been involved in rehabilitating and expanding the Blackbird cobalt mine near Salmon, Idaho. Thus far, the Company has invested more than $35 million in exploration, rehabilitation, mill testing, water treatment, and general clean up. Total estimated cost of the project, if it goes ahead, is $230 million.

We appreciate the Committee's interest in using Government purchase contracts under Title III of the Defense Production Act to develop domestic capacity in cobalt, a strategic metal used in jet engines, engine mounts, armor-piercing shells and other important defense and industrial applications.

The importance of cobalt and other strategic minerals to the creation of a defense industrial base to support military surge capacity has been studied extensively over the past several years, and strong support exists in the Congress and several Executive Branch agencies for using Defense Production Act contracts with domestic producers to assure the U.S. a secure source of cobalt.

I. THE U.S. DOES NOT NOW HAVE A SECURE SOURCE OF COBALT.

The U.S. presently imports 95% of its cobalt supply, 76% of which comes from two African countries, Zaire and Zambia.

Internal instability and the possibility of military conflict with their neighbors make these two countries a highly insecure source of cobalt for the U.S. As recently as 1978, an invasion of the cobalt mining areas of Shaba Province in Zaire resulted in a curtailment of mineral output and a rationing of the available cobalt supply. During this period, the producer price increased from $5 to $25 a pound with the spot price reaching $50. The present market price for a pound of cobalt is $15.

The Defense Stockpile of cobalt, which was recently supplemented by a purchase from Zaire of 5.2 million pounds of cobalt for $78 million, is still 40 million pounds below its goal of 85 million pounds.

II. THE RISK OF PREDATORY PRICING IS AN OBSTACLE TO DEVELOPMENT OF U.S. COBALT CAPACITY.

We recognize and support the Administration's commitment to free market economics. Free market conditions do not exist, however, in the production and sale of cobalt.

Zaire and Zambia presently produce over 60% of the world's supply of cobalt, and since cobalt is a by-product of their copper mines, there is little relationship between their price for cobalt and the cost of operation. In addition, loans provided by international development banks, EXIM Bank, and the U.S.'s Overseas Private Investment Corporation have subsidized the capital costs of the African mines so that pricing competition with potential U.S. mines is not based on the free market. In effect, cobalt supply and prices are controlled by a small number of foreign producers who can use predatory pricing to destroy competition from potential U.S. mines.

III. CONTINGENT PURCHASE CONTRACTS AUTHORIZED BY THE DEFENSE PRODUCTION ACT WOULD REMOVE THE RISK OF PREDATORY PRICING.

The risk of predatory pricing by foreign cobalt producers could be eliminated by contingent purchase contracts between the Government and domestic mines. Such contracts, which are authorized by the Defense Production Act, could provide that if the price of cobalt falls below the price necessary to sustain U.S. production, the Government would purchase cobalt for the stockpile from domestic mines at a price specified in the contract.

DPA contracts were used extensively during the Korean war to develop or expand U.S. mining capacity in copper, iron ore, lead, zinc, manganese, nickel, magnesium, titanium and cobalt. By using contracting techniques to limit the Government's exposure, the Government was able to generate secure domestic sources in these minerals at a cost of less than one-tenth of the face amount of the contracts. The Blackbird mine, which Noranda is currently rehabilitating, was placed in production during the Korean War through use of a Defense Production Act contract.

IV. POTENTIAL U.S. COBALT MINES COULD SUPPLY A MAJOR PORTION OF U.S. NEEDS.

The Blackbird mine, together with mines being developed in Missouri and California, could produce 8 million pounds of cobalt per year by 1985. This would meet over 40% of total U.S. demand

and 100% of the demand for superalloys which are used in defense applications. Blackbird alone could produce 3.7 million pounds of superalloy cobalt per year without considering the additional discoveries now occurring at or near the mine site. These discoveries, plus those occurring in other states, could ultimately result in U.S. self-sufficiency in this important mineral.

V. THE PROPERTY AT BLACKBIRD IS A WORLD-CLASS DEPOSIT OF COBALT.

At present, the geological ore reserves at Blackbird total 4,750,000 tons with average grades of 0.73% cobalt and 1.28% copper. The reserves are located within a "cobalt belt occurrence" about 30 miles long that runs in a northwesterly direction on both sides of the Blackbird property. Noranda is confident that several times the proven ore reserves are present within the cobalt belt and will fall in that inventory following core drilling and development. In addition, the Congress approved legislation in 1980 (P.L. 96-312) authorizing exploration for cobalt in a "Special Mine Management Zone" in the River of No Return Wilderness area near the Blackbird mine. Initial field surveys have confirmed the presence of cobalt mineralization in the Zone.

The mill at Blackbird is now permitted to produce concentrate of up to 300 tons of ore per day. Metallurgical testing of this concentrate will help in the design of the mill process and cobalt refinery. Noranda is developing a process for refining cobalt concentrate into a high-grade cobalt metal to meet requirements for high-temperature and strength alloys.

Noranda has looked at existing processing, which involves the roasting of ore, and rejected the approach because of air quality and other environmental considerations. Instead, Noranda has been doing extensive testing of a hydrometallurgical process which involves high temperature and pressure using reagents to dissolve the cobalt into solution for later electrowinning into pure cobalt metal.

If it were possible for the Blackbird mine to be put into operation, approximately 630 jobs would be created, 450 at the mine/mill and 180 at the refinery. These jobs would be particularly important for the State of Idaho where some 2,000 miners are presently unemployed due to depressed market conditions in the mining industry and the closing of mines for environmental reasons. Without the assurance of a Government contract, it will be necessary for Blackbird to be closed, with further unemployment occurring. Should there later be a disruption in the supply of cobalt from foreign sources, a three- to four-year period would be required to place the project in operation.

VI. DPA CONTRACTS TO DEVELOP DOMESTIC COBALT CAPACITY CAN HAVE LEAST COST AND BUDGETARY IMPACT OF METHODS TO OBTAIN ADEQUATE SUPPLY OF COBALT.

Two methods exist for assuring the U.S. an adequate supply of cobalt: (a) additional purchases for the stockpile, and (b) development of domestic cobalt capacity.

The defense stockpile is a secure source of supply only after the purchases have been made. Anticipating the ability to make such purchases from foreign sources must take into account the security of the sources. In the case of cobalt, that security is questionable at best. Thus, in choosing between stockpile purchases and the development of domestic capacity, it is necessary to assume that the U.S. would purchase sufficient cobalt to meet the stockpile goals.

Purchases of cobalt for the stockpile would have an immediate impact on the Federal budget and outlays. To meet the stockpile goals for cobalt of 85 million pounds, the Government would need to purchase an additional 40 million pounds. At the current world market price of $15 a pound, the budgetary impact and actual cash outlay would be $600 million. Further, assuming a 15% interest rate on Government borrowing to make the purchases, the total cost to the Government to hold the cobalt for 10 years would be $1.5 billion ($600 million plus $600 million X .15 X 10 years).

Properly formulated, DPA contracts with domestic cobalt producers could cost significantly less than purchases to fill the stockpile. Indeed, the cost would be zero if the "world price" of cobalt did not fall below the price negotiated in the contract.

An immediate cost advantage of a DPA contract is that one pound of annual domestic cobalt capacity reduces the stockpile goal by three pounds. This formula is based on the fact that stockpile goals are determined on the basis of the amount of material needed to sustain a three-year war. Thus, 8 million pounds of domestic cobalt capacity would reduce the cobalt stockpile goals by 24 million pounds.

With respect to the budget, the principal advantage of a DPA contract is that outlays (and, therefore, any potential increases in the deficit) would not occur until the fiscal year in which production begins. In the case of the cobalt mines now being rehabilitated in the U.S., the first budget outlay would not occur until FY-86. Moreover, outlays would be spread over the 8 to 10 years of the contract, and the total amount of outlays could be limited by placing a "cap" on the Government's contractual obligation.

VII. CONCLUSION

By using contracting authority under the Defense Production Act the U.S. Government can develop a domestic capacity for the production of cobalt that will assure the country a secure source of supply of a mineral vital to the development of military surge capacity, reduce stockpile goals for cobalt, protect U.S. industry from OPEC-type cartel activities, provide employment in the depressed U.S. mining industry, and improve the U.S. balance of payments. Through use of contract provisions to limit the exposure of the Government, these benefits can be attained at a cost that is less than the cost of filling the cobalt stockpile, and with the impact, if any, on budget outlays and the Federal deficit not occurring until FY-86.

For these reasons, we believe the Congress and the Administration should support DPA contracting for the development of domestic cobalt capacity.

U.S. Senate,
Washington, D.C., October 29, 1981.

Mr. Richard Fiorini,
Vice President and General Manager, Noranda Mining Inc., Salt Lake City, Utah.

Dear Mr. Fiorini: Again I would like to thank you for your participation in the Senate Banking Committee hearing on the Defense Production Act and cobalt held on October 26. Your testimony has been very helpful to this Committee as we begin to form conclusions on how best we may resolve this nation's dependence on foreign imports of strategic materials.

I mentioned in the hearing that there would be additional questions for the record. We would appreciate a prompt response to the questions that are enclosed so that we may close the record and submit it for publication.

Sincerely,

Harrison Schmitt.

QUESTIONS FOR NORANDA

1. The U.S. recently purchased 5.2 million pounds of cobalt from Zaire at $15 a pound. The quality was of very high grade estimated at 99.65 percent purity. Zaire also has a proven reserve base of 70 million pounds of cobalt. Could Noranda, Anschutz, or any other domestic producer provide the quality of cobalt that Zaire is now producing?

2. How long could you continue to produce cobalt; what are the reserves for your project?

3. How long would it take for you to begin production?

4. It is my understanding that the Blackbird project was operating under a DPA Title III contract in 1959. When this program expired mining operations were terminated. Now Noranda is requesting government incentives through Title III to operate the mine. What is to say that in the future, as soon as your Title III contract has expired, Noranda will not discontinue production also?

Noranda Mining Inc.,
Salt Lake City, Utah, November 12, 1981.

Hon. Harrison H. Schmitt,
U.S. Senate,
Senate Banking Committee, Washington, D.C.

Dear Senator Schmitt: In response to your letter of October 29, 1981 concerning additional questions relating to cobalt production from the Blackbird Mine in Idaho, I am pleased to provide you with the following answers:

To question 1: At Noranda our tests show that we can produce very high grade cobalt at a 99.75 to 99.85 percent cobalt content, which is equal to or exceeds that which Zaire is now producing.

To question 2: Our present reserve base is 4,760,000 tons at a 0.73-percent cobalt grade, which is 69,496,000 lbs. of cobalt in place. This is sufficient for 12 years of production. We believe our ultimate reserve will be substantially larger and we presently carry some 21 million tons of geologic indicated reserves including the 4.7 million tons above.

To question 3: If government contracts were approved in early 1982, we could begin production in late 1985.

To question 4: World price of cobalt is currently $17.50 a pound in a soft market situation. The G.S.A. sale was at $15 a pound. If the government contract were of sufficient length to amortize the plant, our studies indicate our cost of production for cobalt to be $11.00 lb. 1981 dollars or considerably below current price.

We, therefore, believe the mine will be a viable business entity after government contracts have been completed.

Hopefully, the above answers your questions and we appreciate your support in this matter.

Sincerely,

R. J. Fiorini,
Vice President-General Manager.

Senator Schmitt. And now, Mr. Melbye?

STATEMENT OF CHARLES E. MELBYE, PRESIDENT, ANSCHUTZ MINING CORP.

Mr. **Melbye**. Thank you, Mr. Chairman. I am president of Anschutz Mining Corp. of Denver, Colo. Anschutz Mining Corp. is a wholly owned subsidiary of the Anschutz Corp. The Anschutz Corp. is privately held and principally engaged in the exploration and production of energy resources and energy-related minerals.

It is a pleasure to appear before your committee and have the opportunity to testify on this important issue. In my testimony today, I will attempt to summarize the following: One, the status and scope of the Madison Mine cobalt project; two, the necessity for Government assistance under the Defense Production Act, if this project is to proceed; three, the Anschutz proposal to the U.S. Government; and four, our suggestion on how this proposal can be moved along to a decision.

Anschutz Mining Corp. has prepared an important project to give the United States it first domestic source of strategically important cobalt. Because of the critical importance of cobalt for national defense requirements, including all jet aircraft, defense aircraft, missiles, and the M-1 tank, the project has received much interest on the part of the U.S. Government agencies, including the Department of Defense, the National Security Council, the Federal Emergency Management Agency, and the Bureau of Mines.

Private industry and various levels of Government have studied, analyzed, and reviewed the shortages, political risks, and critical nature of cobalt. All of these studies and study groups have unanimously agreed that something must be done to give the United States more secure supplies. What Anschutz Mining Corp., at its own risk and initiative, has done is acquire, explore for, and develop what could be the U.S. first integrated production and refining cobalt complex. The Nation, therefore, now has a strong candidate for development of this strategic raw material. The Government must act promptly in formulating its affirmative response if this cobalt project is to remain viable.

REDUCING DEPENDENCE ON FOREIGN IMPORTS

Mr. Chairman, let me summarize briefly the status of the Madison Mine project. Anschutz Mining Corp. is actively engaged in rehabilitating the inactive Madison lead mine at Fredericktown, Mo., which is about 90 miles south of St. Louis, in order to become the first domestic producer of cobalt to come on stream in the United States. This project is targeted to produce 2 million pounds per year of super alloy grade cobalt metal, starting in late 1985. This would reduce U.S. super alloy dependence on foreign imports by about 30 percent.

By the end of 1981, Anschutz Mining Corp. will have committed approximately $30 million on land acquisition, exploration drilling, verification of reserves, mine rehabilitation and development, metallurgical process piloting and refinery design.

Of further importance, the Anschutz refinery will provide a place for other existing lead mines in Missouri, which either produce or can produce a copper-cobalt concentrate, to recover a valuable cobalt resource which is presently lost in the lead and copper smelting process. From these other mine sources, there is a potential for an additional total of 1 to 1.5 million pounds of cobalt per year for at least 10 years. With these additional sources, the Madison project has the high probability of reducing U.S. dependence of foreign imports of cobalt by approximately 50 to 60 percent for super alloy applications.

Anschutz today faces a serious dilemma in trying to develop a domestic source of a strategic metal in the face of low-cost foreign competition. The reason for this is that the United States does not possess any known cobalt reserves comparable to those occurring in Zaire or Zambia. It is not possible for a U.S. company to achieve their low costs of production. The past exhibited operating philosophies of Zaire and Zambia, aided by their low production costs and the byproduct nature of their operations, pose the real probability of predatory price cutting on their part if a project such as Madison Mine comes on line.

U.S. Government support is essential to make investment by private industry feasible. Put simply, the market and political risks are too great to be undertaken solely by private industry. About $150 million more must be invested in facilities to complete the Madison project. Anschutz is prepared to assume all of the technical risks normally associated with a project of this scope and complexity. If successful, we would expect to receive an adequate return on our investment.

Anschutz Mining Corp. has proposed that the Government use its authority under title III of the Defense Production Act to negotiate a long-term purchase commitment which would provide assurance that a fair price could be obtained for this badly needed domestic cobalt.

Senator SCHMITT. Could you give me a range of numbers where you think that fair price might fall? I don't want to interfere with your negotiations in any way.

Mr. MELBYE. Well, it's in the mid-20's. We had a preliminary feasibility study done about a year and a half ago that indicated a price of about $28.50. Now we have completed extensive metallurgical testing in Golden and Germany and down in Tucson, using the best technology we can find, and we are reducing the floor price considerably from what we originally thought we had to have. So the final feasibility study will be done and we will be able to come up with a final number. But we are trying to reduce this as much as possible.

Senator SCHMITT. Has Noranda made any comparable studies?

Mr. FIORINI. Yes, we have, Mr. Chairman. We did a feasibility study here about 1 year ago, ourselves, which indicated a price at that time of roughly $20. We are in the midst of doing an updated one. In our case, the metallurgy hasn't changed that much but our ore reserves have changed very dramatically on the upside, which will provide for a larger complex and it will have an effect on the price, but we don't know yet what that will be.

Senator SCHMITT. Thank you. Please proceed.

Mr. MELBYE. A summary of the proposal is part of the attachments which I have submitted to this committee this morning. Such an arrangement would enable the Madison project to proceed. Under this proposal, Anschutz assumes the process, construction, and completion risks and shares a portion of the market downside risks. Facilities loans would be obtained by Anschutz from private banking sources without a Government guarantee of the loan. It should be emphasized that if, for any reason, Anschutz does not produce or deliver the cobalt, the Government owes nothing. This purchase commitment would enable the Government to take delivery of the cobalt for stockpile use or otherwise. The Government could also elect instead to allow all or some of the cobalt to be sold in the domestic open market.

The Government's maximum potential liability under title III of DPA, spread out over 10 years, would be limited by contract to a total dollar amount to be negotiated. In other words, the total maximum budget authority necessary during the 10-year duration of the contract would be fixed. Realistically, the budget outlays would be expected to turn out be much less, possibly zero, and not beginning at least until late in calendar year 1985.

I would like to emphasize that under the Anschutz proposal, no cash outlay by the Government would be necessary at least until late in calendar year 1985 when the first cobalt would be ready to be delivered and it is possible that no cash outlay by the Government would ever be required.

Senator Schmitt. Would never be required if the market price was above the price negotiated?

Mr. Melbye. That is correct

Although we consider such a mechanism to be the best alternative, we wish to make it clear to this committee that Anschutz is not in any way inflexible, and that if the Government prefers, we are prepared to consider other options such as low-interest loans, a government-built refinery to be operated by Anschutz, or low-interest loans with reduced price guarantees.

Be it a long-term purchase commitment or otherwise, the issue before us this morning is that what is needed now is legislative authorization to make a commitment for fiscal year 1982 using title III of the Defense Production Act. This will allow us to enter into serious, good faith discussions with appropriate departments of the Government to further develop the proposal and, if determined to be in the best interest of the Government, negotiate a contract.

We appreciate your committee's invitation to testify and urge your attention to this critical national issue. I would be pleased to answer any questions or to provide additional information.

Senator Schmitt. At this point. I would like to place in the record the statement of William Hosken, the president of the California Nickel Corp. California Nickel is developing a major cobalt, chromium and nickel project in northern California which could contribute significantly to meeting the national need for strategic metals. The specifics of the project are spelled out in the testimony Mr. Hosken has submitted at the request of the committee.

[The complete statements of Mr. Melbye and Mr. Hosken follow:]

STATEMENT OF
CHARLES E. MELBYE
PRESIDENT, ANSCHUTZ MINING CORPORATION

BEFORE THE SENATE
COMMITTEE OF BANKING, HOUSING AND URBAN AFFAIRS
OCTOBER 26, 1981

Good morning, Mr. Chairman and honorable members of this Committee. My name is Charles Melbye. I am President of Anschutz Mining Corporation of Denver, Colorado. Anschutz Mining Corporation is a wholly-owned subsidiary of The Anschutz Corporation. The Anschutz Corporation is privately held and principally engaged in the exploration and production of energy resources and energy related minerals.

It is a pleasure to appear before your Committee and have the opportunity to testify on this important issue.

In my testimony today I will attempt to summarize the following:

1. The status and scope of the Madison Mine Cobalt Project.
2. The necessity for Government assistance under the Defense Production Act, if this project is to proceed.
3. The Anschutz proposal to the United States Government.
4. Our suggestion on how this proposal can be moved along to a decision.

Anschutz Mining Corporation has prepared an important project to give the United States its first domestic source of strategically important cobalt. Because of the critical importance of cobalt for national defense requirements (including all jet aircraft, defense aircraft, missiles, and the M-1 tank), the project has received much interest on the part of the U. S. Government agencies, including the Department of Defense, the National Security Council, the Federal Emergency Management Agency and the Bureau of Mines.

Private industry and various levels of government have studied, analyzed and reviewed the shortages, political risks, and critical nature of cobalt. All of these studies and study groups have unanimously agreed that something must be done to give the U. S. more secure supplies. What Anschutz Mining Corporation, at its own risk and initiative, has done is acquire, explore for and develop what could be the United States' first integrated production and refining cobalt complex.

The Nation, therefore, now has a strong candidate for development of this strategic raw material. The Government must act promptly in formulating its affirmative response if this cobalt project is to remain viable.

THE MADISON PROJECT

Mr. Chairman, let me summarize briefly the status of the Madison Mine Project.

Anschutz Mining Corporation is actively engaged in rehabilitating the inactive Madison lead mine at Fredericktown, Missouri, which is about 90 miles south of St. Louis, in order to become the first domestic producer of cobalt to come on stream in the United States. This project is targeted to produce two million pounds per year of super alloy grade cobalt metal, starting in late 1985. This would reduce U. S. super alloy dependence on foreign imports by about 30 percent.

By the end of 1981, Anschutz Mining Corporation will have committed approximately $30 million on land acquisition, exploration drilling, verification of reserves, mine rehabilitation and development, metallurgical process piloting and refinery design.

Of further importance, the Anschutz refinery will provide a place for other existing lead mines in Missouri, which either produce or can produce a copper-cobalt concentrate, to recover a valuable cobalt resource which is presently lost in the lead and copper smelting process. From these other mine sources, there is a potential for an additional total of 1,000,000 to 1,500,000 pounds of cobalt per year for at least 10 years. With these additional sources, the Madison Project has the high probability of reducing U. S. dependence of foreign imports of cobalt by approximately 50 to 60 percent for super alloy applications.

THE ANSCHUTZ DILEMMA

Anschutz today faces a serious dilemma in trying to develop a domestic source of a strategic metal in the face of low-cost foreign competition. The reason for this is that the United States does not possess any known cobalt reserves comparable to those occurring in Zaire or Zambia. It is not possible for a U. S. company to achieve their low costs of production. The past exhibited operating philosophies of Zaire and Zambia, aided by their low production costs and the by-product nature of their operations, pose the real probability of predatory price cutting on their part if a project such as the Madison Mine comes on line.

U. S. Government support is essential to make investment by private industry feasible. Put simply, the market and political risks are too great to be undertaken solely by private industry.

About $150,000,000 more must be invested in facilities to complete the Madison Project. Anschutz is prepared to assume all of the technical risks normally associated with a project of this scope and complexity. If successful, we would expect to receive an adequate return on our investment.

ANSCHUTZ PROPOSAL

Anschutz Mining Corporation has proposed that the Government use its authority under Title III of the Defense Production Act to negotiate a long-term purchase commitment which would provide assurance that a fair price could be obtained for this badly needed domestic cobalt. A summary of the proposal is part of the attachments which I have submitted to this Committee this morning. Such an arrangement would enable the Madison Project to proceed.

Under this proposal, Anschutz assumes the process, construction and completion risks and shares a portion of the market downside risks. Facilities loans would be obtained by Anschutz from private banking sources without a Government guarantee of the loan. It should be emphasized that if for any reason Anschutz does not produce or deliver the cobalt, the Government owes nothing. This purchase commitment would enable the Government to take delivery of the cobalt for stockpile use or otherwise. The Government could also elect instead to allow all or some of the cobalt to be sold in the domestic open market.

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Although we consider such a mechanism to be the best alternative, we wish to make it clear to this Committee that Anschutz is not in any way inflexible, and that if the Government prefers, we are prepared to consider other options such as low interest loans, a government built refinery to be operated by Anschutz, or low interest loans with reduced price guarantees.

Be it a long-term purchase commitment or otherwise, the issue before us this morning is that what is needed now is legislative authorization to make a commitment for fiscal year 1982 using Title III of the Defense Production Act. This will allow us to enter into serious, good faith discussions with appropriate departments of the Government to further develop the proposal and, if determined to be in the best interest of the Government, negotiate a contract.

We appreciate your Committee's invitation to testify and urge your attention to this critical national issue. I would be pleased to answer any questions or to provide additional information.

IMPORTANCE OF COBALT

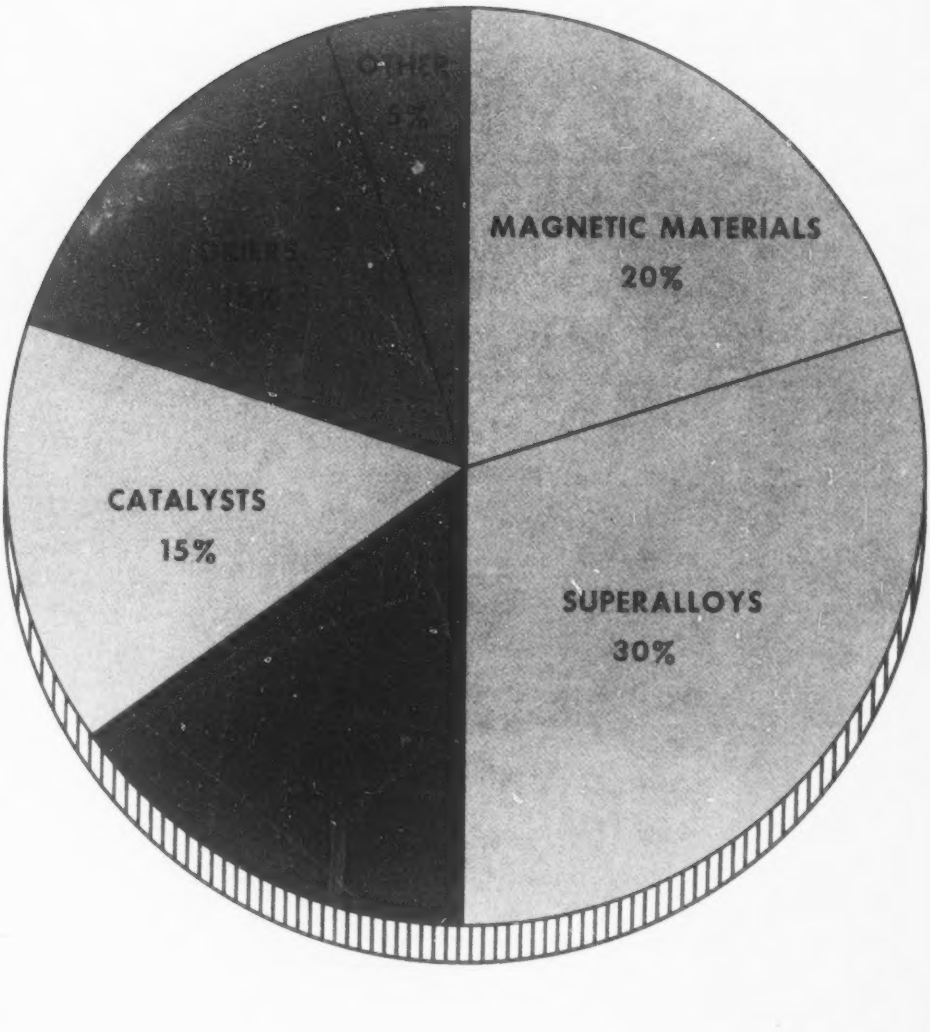
Cobalt, first used 2,000 years ago as a color additive for glass, has developed into a strategic metal, adequate supplies of which are vital to U. S. industry and national defense. Uses for cobalt have been found in numerous industries. The properties it imparts, in some critical applications, have not been duplicated by substitution of other materials. It is the "irreplaceable" nature of cobalt and the United States' almost total dependence on foreign sources of supply, which places this metal at the top of the list of Critical Strategic Materials. U. S. policymakers must weigh national security against the cost of developing domestic resources.

MAJOR U.S. CONSUMING INDUSTRY SEGMENTS

The major consuming industry segments and their percentage of total U. S. consumption are:

1. Super alloys	30%
2. Tools, cemented carbide, hard facing	15%
3. Catalysts	15%
4. Magnetic materials	20%
5. Driers, dyes, pigments	15%
6. Others	5%

U.S. COBALT CONSUMPTION BY INDUSTRY



The largest single use for cobalt is in super alloys. These alloys can contain up to 65% cobalt.

The majority of the cobalt used in super alloys is for jet engine parts. It is critical for all jet aircraft and defense aircraft such as the F-14, F-15, F-16, F-18 and A10, missiles and the M-1 tank.

Another critical application is in industrial turbines for power generation.

At this time, industry has been unable to find a substitute for cobalt in alloys able to cope in such critical high temperature environments.

Super alloy demand is expected to continue to increase in the future due to a possible upsurge in military aircraft and greater use of super alloys in such markets as chemical processing, power generation, synthetic fuels, and sour oil and gas well tooling.

Cobalt is an important constituent in tools requiring very high strength and abrasion resistance, along with being used as a component in several high speed machinery steels. Its application in cemented carbide as the binder in the metal matrix is especially critical. Until recently, 100% of the cobalt powder needed for this application came from foreign sources.

Another important application today in the metal working area is that of thermal or plasma spraying of hardfacing materials.

This whole area of carbide bits, drills and hardfacing materials has a strong growth projection, being driven by increased mining, drilling and other energy related activities. To date, no reasonable alternatives to cobalt have been found.

Today, cobalt is used as a catalyst in hydrogenation. The increased use of tertiary recovery and high sulfur crudes will expand the requirements for petroleum desulfurization (cobalt-molybdenum) catalysts. Substitution of cobalt with nickel in petroleum catalysts reduces octane ratings and requires higher pressures to be efficient. To date substitutes for cobalt as a catalyst have generally not been found to be effective.

Magnetic materials are a consumer of cobalt in the U. S. Cobalt additives increase the magnetization and bring curie temperatures to higher values than can normally be achieved with pure iron. The properties that cobalt contributes to permanent magnetics exceed those that can be achieved using any other element. Substitution of cobalt results in weight disadvantages and/or other losses of physical properties. Because of the advantages provided, cobalt magnets are used in magnetic couplings, meters, loudspeakers, permanent magnet motors and repulsion devices.

Cobalt oxides and organic compounds are used in paints and ceramics as dyes, driers, pigments and oxidizers.

Other uses of cobalt are numerous, ranging from cobalt-60 isotopes providing gamma radiation for research, treatment or industrial radiography to cobalt alloys used in the dental field. Surgical implants will continue to need cobalt.

IMMUNITY TO SUBSTITUTION

To review, the uses of cobalt are numerous. Its ability to impart certain properties has made it an essential element in many applications:

High Temperature Performance The major factor is availability. It is doubtful that cobalt will be replaced in superalloys for aircraft and turbines in the next 10 to 20 years. Without this strategic metal, performance levels of key weapons systems would be severely impaired.

Corrosion and Abrasion Resistance - will make cobalt indispensible to the oil industries as increased uses of "sour" gases and oils drive the demand for cobalt-bearing super alloys.

Desulfurization Catalysts - increased tertiary recovery and increased use of sour crudes will increase the use of moly-cobalt catalysts in the petroleum industry.

Super Alloy Demand - as technology advances, chemical processing and synthetic fuels will increase the demand for cobalt-bearing super alloys.

Cemented Carbide - the demand for cobalt powder as the binder in cemented carbide will increase, as energy demands expand drilling and mining activity. Real growth is projected to exceed 4 percent per year.

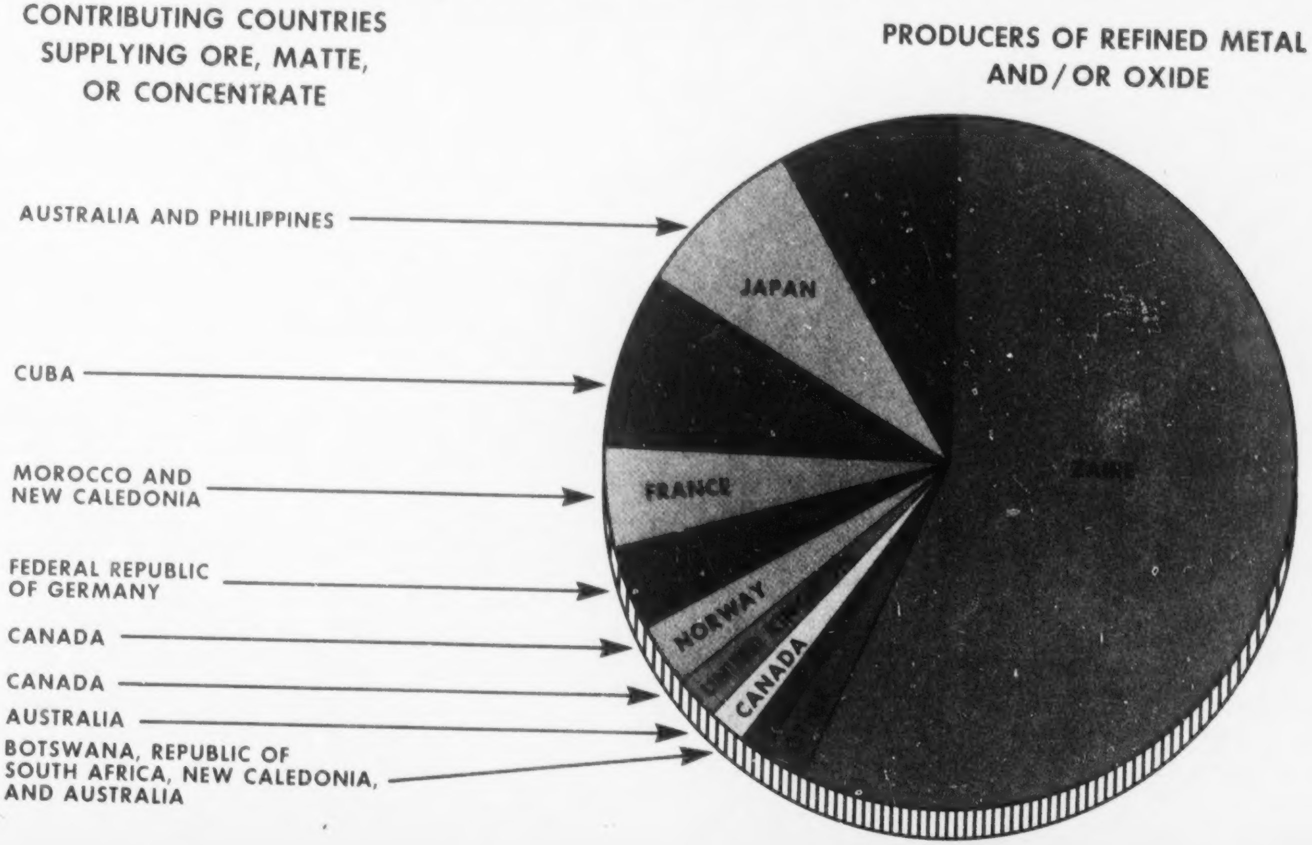
DEPENDENCE ON FOREIGN SUPPLY

The basic U. S. problem regarding this strategic metal is dependence on foreign supply.

In 1971, all cobalt mine production in the U. S. ceased. Since that time, all domestic production has been from relatively minor amounts of secondary material derived from recycled alloys or scrap.

The U. S. has been forced to rely on foreign sources. This problem is compounded by the fact that the concentration of higher grade deposits are in only a few areas of the world. The following illustration emphasizes the problem.

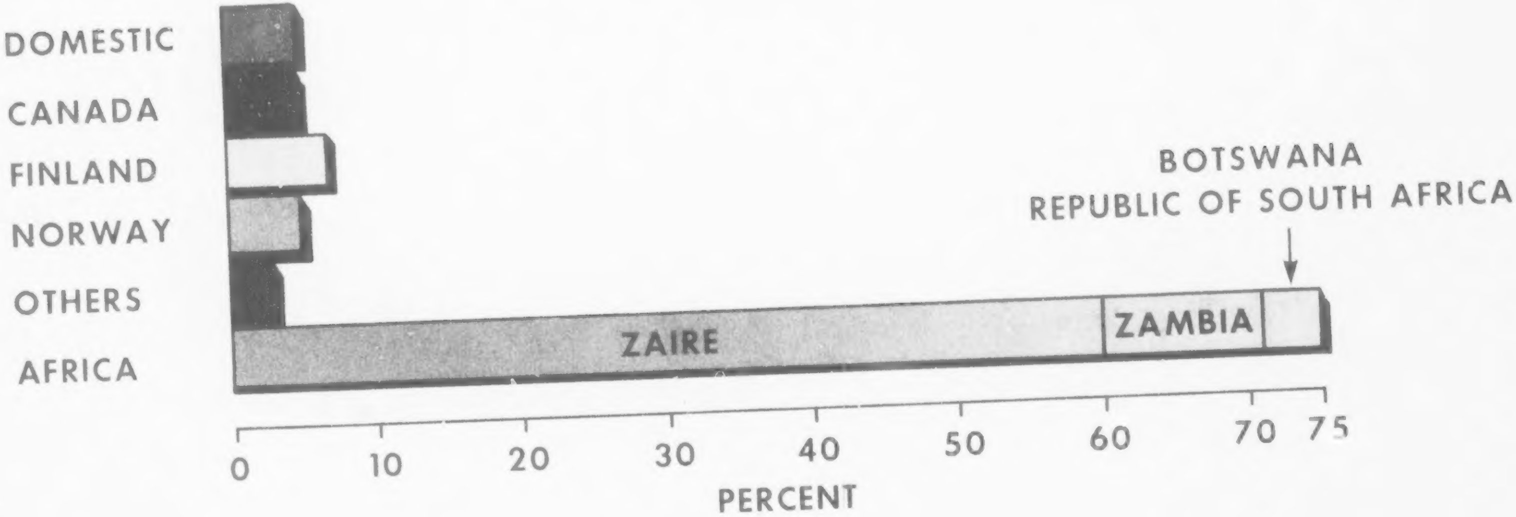
DISTRIBUTION OF ESTIMATED WORLD REFINED COBALT METAL AND OXIDE PRODUCTION IN 1978



In 1978, Zaire accounted for an estimated 57% of the total world refined metal production. If Zambia is included, 65% of the total world production is represented. Any disruption or withholding of cobalt supplies by these two countries would have serious consequences on a worldwide basis. Since the U. S. consumes approximately 40% of total world consumption, the effects could be disasterous.

The U. S. is particularilly vulnerable. Ninety-five percent of our sources of cobalt are foreign, with 75% coming from one geographical area, Southern Africa.

U.S. DEPENDENCE ON FOREIGN SOURCES OF COBALT



The potential problem lies in the existence of relatively insecure supplies owing to the small number of high-grade deposits in the world. The fragility of these supplies was demonstrated in 1976 when difficulties in Angola caused transportation problems, and in 1977 and 1978 when insurgent attacks in the Shaba Province mining region occurred. The threat of future disruptions remains. Also, the concentration of cobalt supply in the hands of a relatively few, provides leverage to the producing countries, whereby pricing could be artificially increased.

The Subcommittee on Mines and Mining of the House Committee on Interior and Insular Affairs covered the dependence and potential problems facing the United States in their July 8, 1980 report "Sub-Sahara Africa: Its Role in Critical Mineral Needs of the Western World."

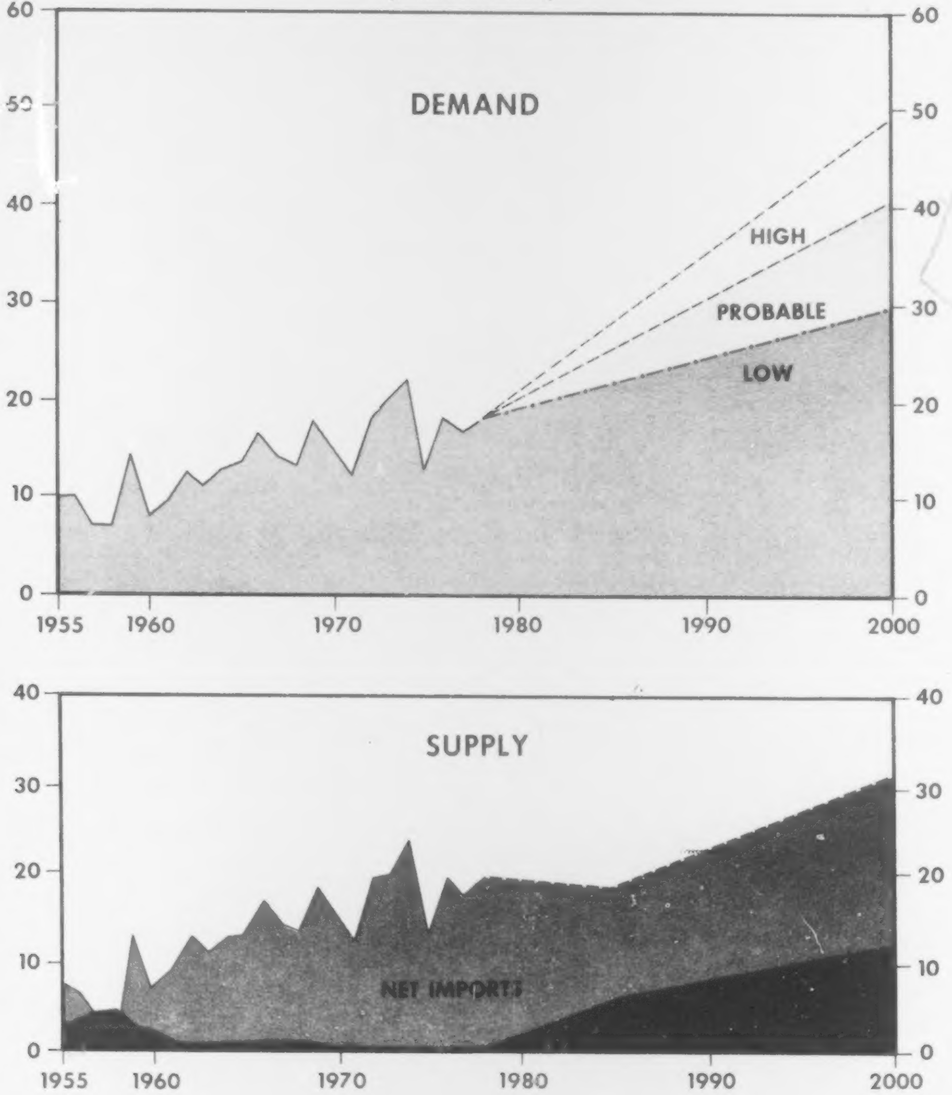
If disruptions should occur due to either economic or political reasons, it would normally take between five and eight years to develop a domestic cobalt source from grass roots. The Madison Mine Project (because of the extensive exploration, drilling, mine development, metallurgical piloting and project feasibility work) could be in operation in three years. It is important that the current momentum not be lost.

U. S. total annual demand for cobalt is forecast by the Bureau of Mines to grow at 3.5% and to reach 45.6 million pounds in 2000. The annual total demand for the rest of the world is forecast to grow at 3.6%, reaching 70 million pounds in 2000.

At this time, it is unlikely that United States mine production will achieve the projected levels. Unless a positive economic environment is created, it is expected that U. S. reliance on imports will increase.

U.S. PRIMARY COBALT SUPPLY AND DEMAND 1955-2000

(MILLION POUNDS)



BUREAU OF MINES

COBALT PRICING

The pricing of cobalt tends to be artificial since it is mainly produced as a by-product of copper and nickel production. Zaire and Zambia, with over 65% of total world production, are capable of controlling the world market price. The current economic downturn in the Western Economies appears to have stymied their efforts for the moment.

Since 1964, producer cobalt prices have risen from $1.50 per pound to $25 per pound. In 1978, the free market saw prices reach as high as $50 per pound as companies scrambled for material. Four of the major factors effecting these increases are highlighted:

1. The Canadian nickel strike (1970): Shows cobalt's supply dependent on nickel production.
2. U. S. stockpile sales discontinued (1976): U. S. supply decreased by 5 million pounds per year.
3. Insurgent attacks in Shaba Province (1977 and 1978): Threat of disruption creates market panic.
4. High demand, lack of substitution (1978 and 1979): Increased demand with no substitutes drive free market pricing to $50 per pound.

The lack of substitutions for critical applications:

1. Super alloys
2. Cemented carbide and hardfacing

3. Certain catalysts

cause violent swings in pricing for cobalt as industry struggles to obtain material at any price. A recent study prepared indicates that cobalt pricing could exceed $150 per pound if supplies are restricted from Southern Africa. In the period of disruption in 1977 and 1978, cobalt saw an increase of 630 percent, as it went from a base of $6.85 per pound to a peak of $50 per pound. A similar example of this price susceptability of critical metals to disruption was in 1969 when the nickel strike caused a 370 percent increase or pricing going from $1.60 per pound to $7.50 per pound.

FREE MARKET PRICES DURING PAST DISRUPTIONS

(Nominal Dollars per Pound)

MARKET	BEFORE SHORTAGE	AT PEAK	PERCENT CHANGE IN PRICE
Cobalt, 1978	6.85	50.00	630
Nickel, 1969	1.60	7.50	370

SOURCE: Charles River Associates, 1981

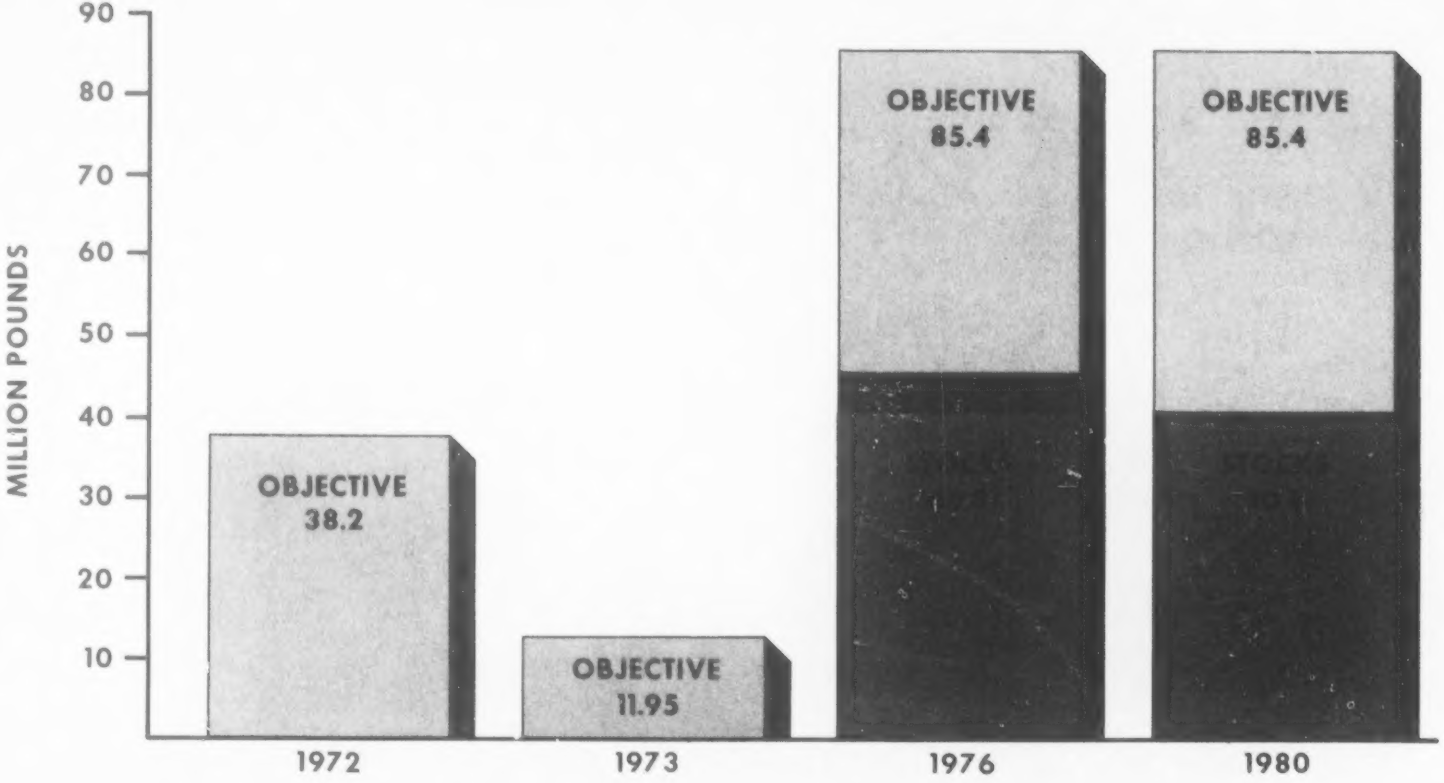
GSA STOCKPILE

One source of insurance against disruptions in supplies of strategic materials is the GSA stockpile. However, this source is critically low.

In 1976, sales of cobalt from GSA stockpile were discontinued and the stockpile objective increased from 12 million pounds to 85 million pounds. At present, the stockpile has only 40.8 million in storage. The Administration, recognizing the problem, recently authorized a 5.2 million pound purchase by GSA.

The Madison Mine project starting in 1985 will produce 2 million pounds per year of cobalt metal. This quantity would be sufficient to fulfill half of the existing stockpile shortfall of 40 million pounds.

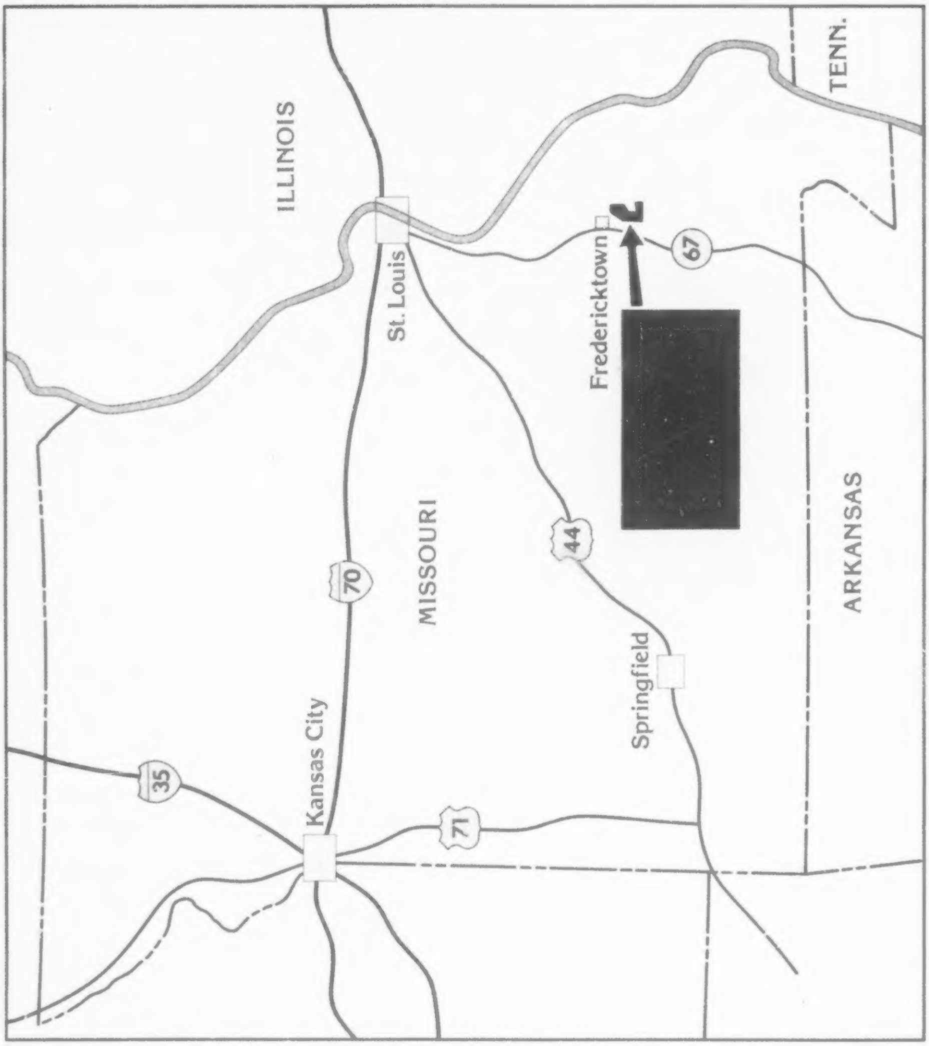
GSA STOCKPILE-COBALT



MADISON MINE COBALT PROJECT

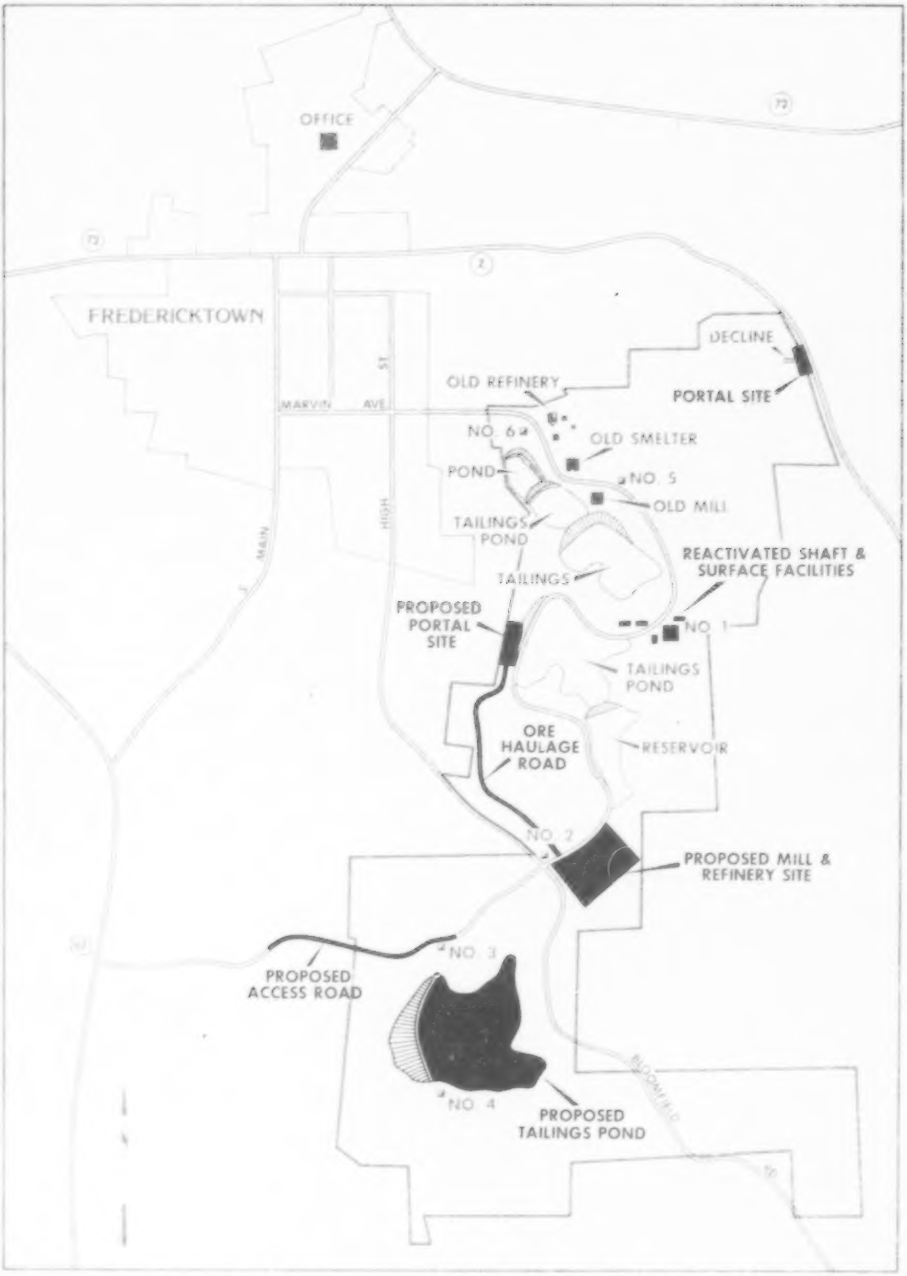
The following section provides a brief overview and summary of the Madison Mine Cobalt Project. It will show that the U.S. has a domestic cobalt project, which is "up and running" and which could be producing metal by 1985.

MADISON MINE
PROJECT
COBALT


ILLINOIS
St. Louis
Fredericktown
67
TENN.
MISSOURI
70
44
Springfield
ARKANSAS
Kansas City
35
71

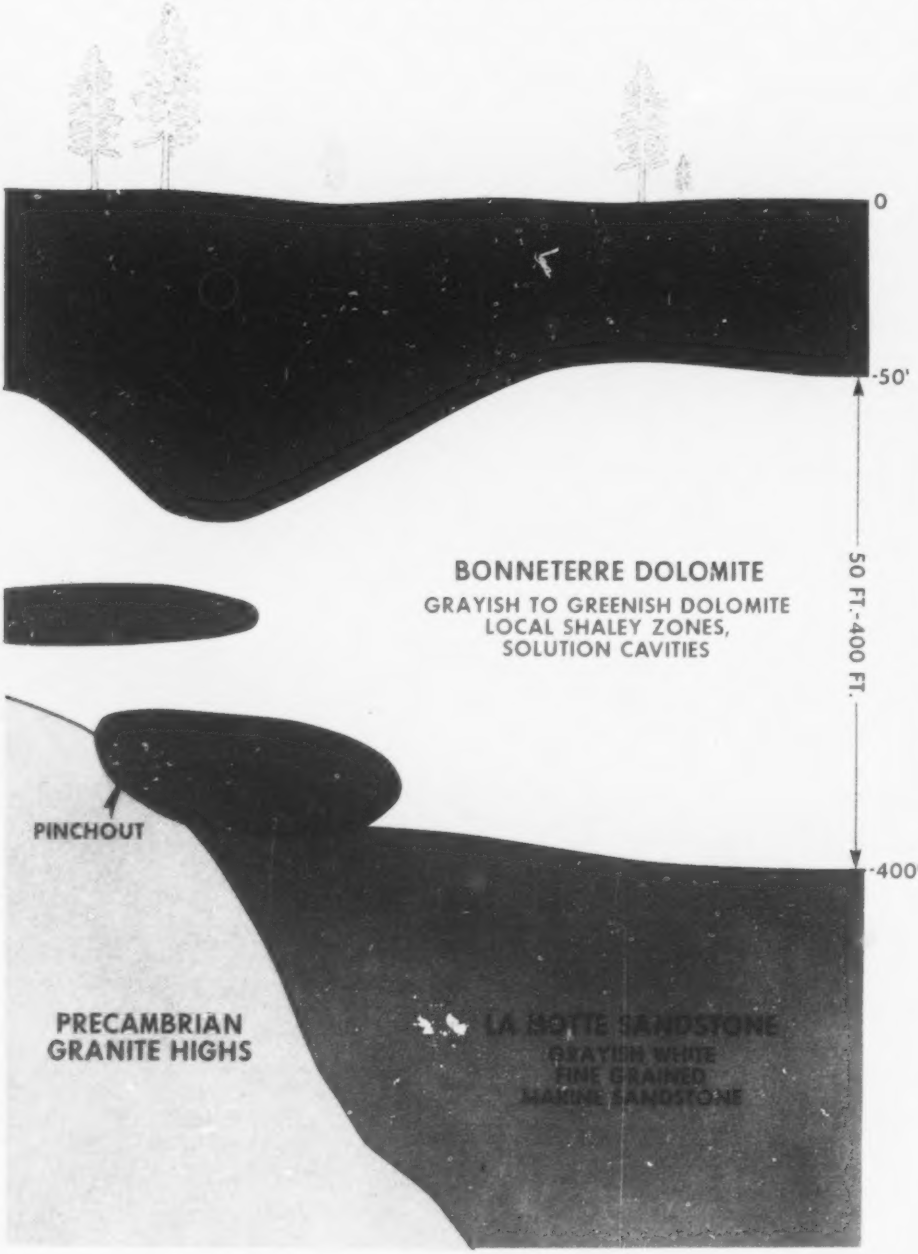
HISTORY

1700 –	• LEAD DEPOSITS DISCOVERED AT MINE LA MOTTE
1847	• MADISON MINE OPENED AS COPPER MINE – 2 YEARS
1860 – 1863	• OPERATED FOR Pb & Cu UNTIL THE CIVIL WAR
1901 – 1910	• NORTH AMERICAN LEAD CO. OPERATED FOR Pb, Cu, Co–Ni CONCENTRATES
1913 – 1920	• CANADIAN INTERESTS ACQUIRED THE PROPERTY & OPERATED AS MISSOURI COBALT COMPANY
1927 – 1933	• NATIONAL LEAD EXPLORED AREA & ACQUIRED SOUTH PORTION (#2 MINE)
1944 – 1961	• NATIONAL LEAD ACQUIRED MISSOURI COBALT PROPERTY & OPERATED THE MADISON MINE FOR Pb, Cu CONCENTRATES, Co, AND Ni
1979 –	• ANSCHUTZ ACQUIRED AN OPTION THROUGH THE NEDLOG TECHNOLOGIES GROUP, ACQUIRED THE PROPERTY & BEGAN EXPLORATION, EVALUATION & METALLURGICAL RESEARCH


OFFICE
72
72
2
FREDERICKTOWN
DECLINE
PORTAL SITE
OLD REFINERY
MARVIN AVE
ST.
HIGH
MAIN
NO. 6
OLD SMELTER
POND
NO. 5
OLD MILL
TAILINGS POND
TAILINGS
REACTIVATED SHAFT & SURFACE FACILITIES
PROPOSED PORTAL SITE
NO. 1
TAILINGS POND
ORE HAULAGE ROAD
RESERVOIR
NO. 2
PROPOSED MILL & REFINERY SITE
NO. 3
PROPOSED ACCESS ROAD
NO. 4
PROPOSED TAILINGS POND
BLOOMFIELD

PROPOSED SURFACE PLAN

GENERALIZED GEOLOGIC CROSS—SECTION


0
-50'
50 FT.-400 FT.
-400'
BONNETERRE DOLOMITE
GRAYISH TO GREENISH DOLOMITE
LOCAL SHALEY ZONES,
SOLUTION CAVITIES
PINCHOUT
PRECAMBRIAN
GRANITE HIGHS
LA MOTTE SANDSTONE
GRAYISH WHITE
FINE GRAINED
MARINE SANDSTONE

PROPOSED MINING PLAN

PHASE I MINE REHABILITATION AND DEVELOPMENT

A. FIRST ACCESS THROUGH THE 45° DECLINE

1. MAPPING
2. SAMPLING
3. EQUIPMENT INGRESS

B. REOPEN No. 1 SHAFT

1. PERSONNEL ACCESS
2. VENTILATION
3. SURFACE FACILITIES

C. CONSTRUCT HAULAGE DECLINE & CRUSHER STATION

D. ESTABLISH ROADWAYS, SUMPS & UTILITIES

E. DEVELOP PRODUCTION AREAS

PHASE II MINE PRODUCTION

A. ROOM & PILLAR MINING FOR 2/3rds OF PRODUCTION

B. CUT & FILL MINING FOR 1/3rd OF PRODUCTION

C. TRACKLESS DIESEL EQUIPMENT

D. UNDERGROUND CRUSHING

E. CONVEYER TO SURFACE

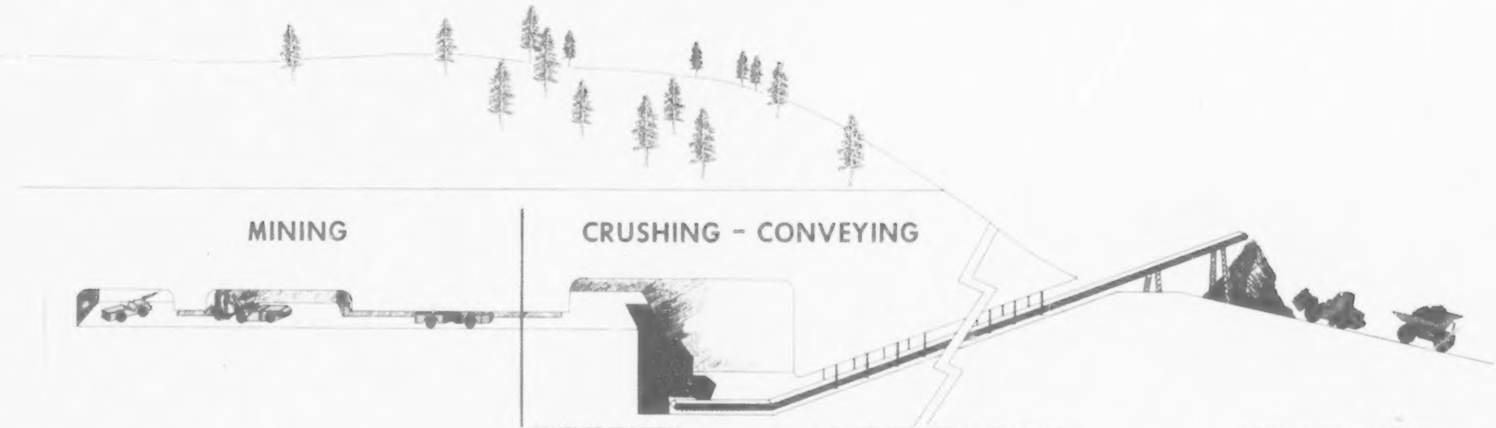
F. TRUCK TRANSFER TO CRUSHERS AT THE MILL

PHASE III REPROCESSING OF OLD MILL TAILINGS

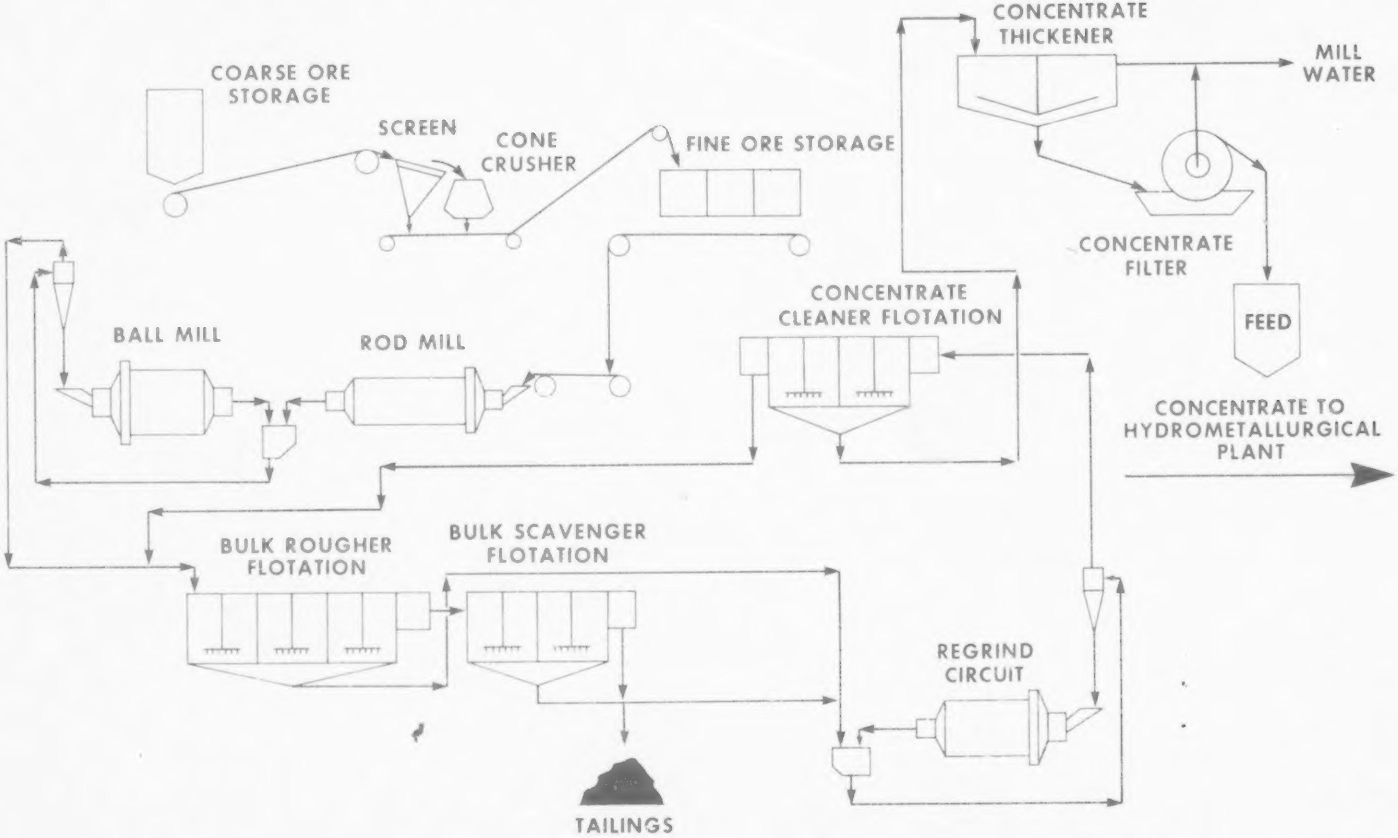
A. RECLAIM TAILS WITH HYDRAULIC MONITORS

B. PUMP SLURRY TO MILL FEED THICKENER

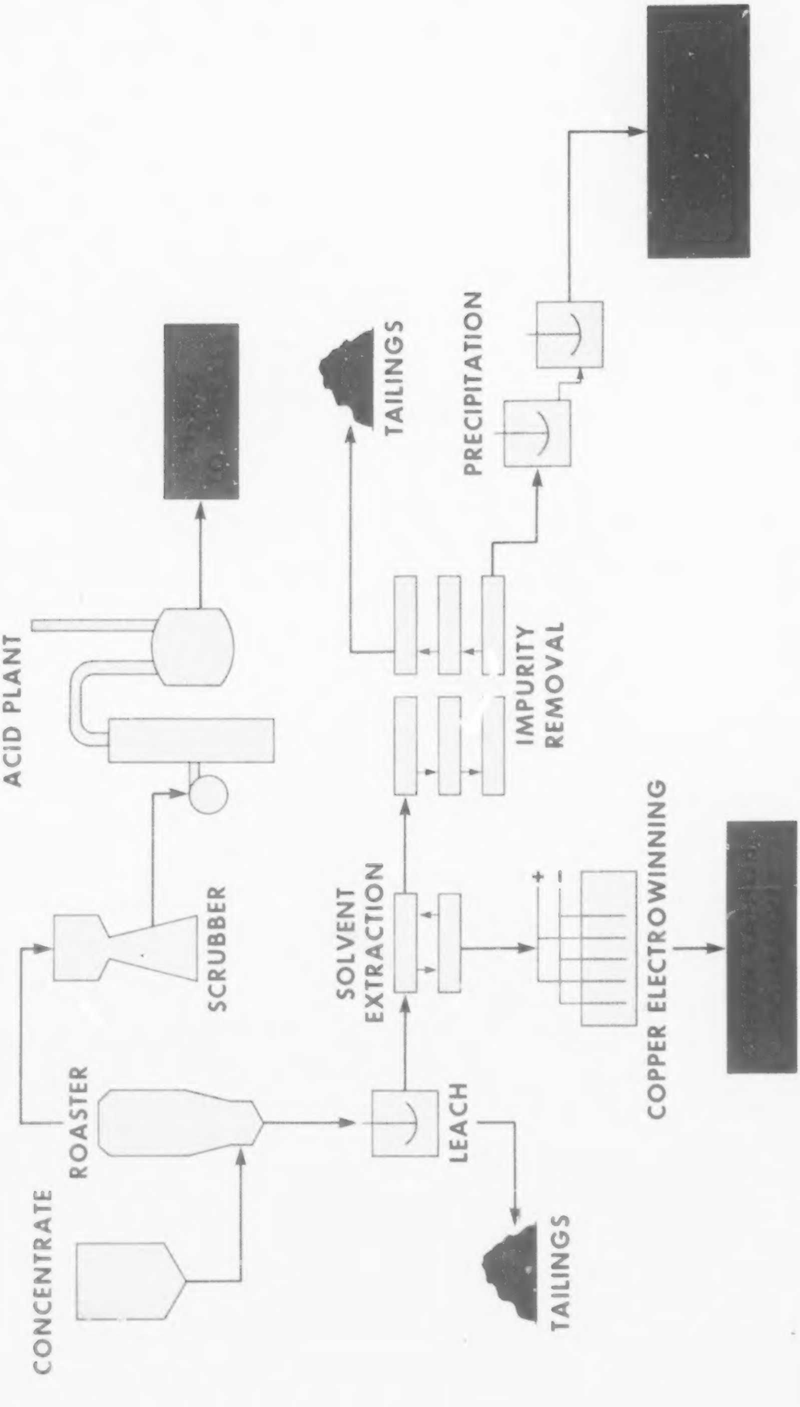
SCHEMATIC MINING SECTION


MINING
CRUSHING - CONVEYING
CRUSHER STATION: GRIZZLY, FEEDERS, AND CRUSHER TO REDUCE MINE RUN ORE TO -8" FOR CONVEYING
CABLE SUSPENDED CONVEYOR AT 20% INCLINE FOR MOVING ORE TO SURFACE
SURFACE STOCKPILE OF PRIMARY ORE FOR TRANSFER BY TRUCKS TO MILL

MADISON COBALT PROJECT - MILLING PLANT


CONCENTRATE THICKENER
MILL WATER
COARSE ORE STORAGE
SCREEN
CONE CRUSHER
FINE ORE STORAGE
CONCENTRATE FILTER
FEED
CONCENTRATE CLEANER FLOTATION
BALL MILL
ROD MILL
CONCENTRATE TO HYDROMETALLURGICAL PLANT
BULK ROUGHER FLOTATION
BULK SCAVENGER FLOTATION
REGRIND CIRCUIT
TAILINGS

HYDROMETALLURGICAL PLANT


CONCENTRATE
ROASTER
SCRUBBER
ACID PLANT
LEACH
TAILINGS
SOLVENT EXTRACTION
IMPURITY REMOVAL
TAILINGS
PRECIPITATION
+
−
COPPER ELECTROWINNING

STATUS - CURRENT

I. GEOLOGY

1. CORE DRILLING - THREE (3) RIGS -
   2 ON 2 SHIFT/DAY
   1 ON 1 SHIFT/DAY
2. ROTARY DRILLING - ONE (1) RIG
3. DRILL HOLES TO DATE - 120
4. CORE EVALUATED AND ANALYZED

II. MINING

1. MINE DEWATERED
2. No. 1 SHAFT COLLAR BEING REHABILITATED
3. EXISTING 45° DECLINE SURFACE AREA REHABILITATED
4. STORAGE BUILDING CONSTRUCTION UNDERWAY
5. EXISTING TAILINGS DAM SOILS TESTING UNDERWAY

III. METALLURGY

1. HISTORICAL DATA REVIEWED
2. BENCH SCALE FLOTATION TESTING (TAILINGS & CORE)
3. PILOT PLANT (4 TPD) FLOTATION TESTING (TAILINGS)
4. PILOT SCALE ROASTING TESTS ON PILOT PLANT CONCENTRATES
5. BENCH AND PILOT SCALE TESTS FOR EXTRACTION PROCESS DEVELOPMENT
6. LIMITED PILOT SCALE CONTINUOUS TESTING OF EXTRACTION FLOWSHEET (ROASTED TAILINGS CONCENTRATE)
7. CONFIRMATION FLOTATION, ROASTING, AND LEACHING TESTS (CORE)

STATUS - PLANNED

I. GEOLOGY

1. SURFACE
    - CORE DRILLING TO CONTINUE AT CURRENT RATE
    - CORE EVALUATIONS AND ANALYSIS TO CONTINUE AT CURRENT RATE
2. UNDERGROUND
    - LONG HOLE DRILLING
    - DIAMOND DRILLING
    - CHANNEL SAMPLING

II. MINING

1. No. 1 SHAFT REHABILITATION
2. EXISTING 45° DECLINE REHABILITATION
3. UNDERGROUND WORKINGS INSPECTION AND REHABILITATION
4. COLLECT UNDERGROUND SAMPLES FOR CONFIRMATION TESTING
5. CONSTRUCT PERSONNEL AND PRODUCTION FACILITIES
6. PURCHASE MINING EQUIPMENT

III. METALLURGY

1. CONFIRMATORY INTEGRATED TESTING OF UNDERGROUND SAMPLES (10-20T) FOR MILLING AND REFINING
2. INVESTIGATION OF METAL SEPARATIONS
3. EVALUATION OF FINAL PRODUCT OPTIONS: METAL, CARBONATES, CHEMICALS
4. PREPARATION OF DEFINITIVE ENGINEERING REQUIREMENTS FOR MILL-REFINERY FACILITY

ANSCHUTZ PROPOSAL TO THE UNITED STATES GOVERNMENT TO NEGOTIATE A PRICE DIFFERENTIAL CONTRACT FOR DOMESTIC COBALT PRODUCTION

(Current as of September 1981)

The Anschutz Mining Corporation of Denver, Colorado, has prepared an important project to give the United States its first domestic source of strategically important cobalt. Because of the critical importance of cobalt for national defense requirements (including all jet aircraft and defense aircraft such as the F-14, F-15, F-16, F-18, and A-10, missiles and the M-1 tank), the project has received much interest on the part of U.S. Government agencies, including the Department of Defense, the National Security Council, the Federal Emergency Management Agency and the Bureau of Mines. However, prompt Government support is required to make the project feasible.

Private industry and various levels of government have studied, analyzed and reviewed the shortages, political risks, and critical nature of cobalt. All of these studies and study groups have unanimously agreed on the fact that something must be done to give the U.S. more secure supplies. What the Anschutz Mining Corporation has done, at its own risk and initiative, is to acquire, explore for and develop what could be the United States' first integrated production and refining cobalt complex.

The Anschutz project, by itself, has the high probability of reducing the United States' dependence on foreign imports of cobalt by approximately 50 to 60 percent for superalloy (most critical) applications.

The Government, therefore, now has a strong candidate for development of this most important critical and strategic raw material. What is now needed is for the Government to act promptly in formulating its affirmative response to this request by private industry. Timing is essential to the success of this project.

The Anschutz Mining Corporation requests prompt action on its request to Government at this time.

THE MADISON PROJECT

The Anschutz Mining Corporation is actively engaged in rehabilitating a former, closed Madison lead mine at Fredericktown, Missouri, to become the first domestic producer of cobalt to come on stream in the United States. This up and running project, targeted to be producing two million pounds per year of cobalt metal, starting in 1985, could significantly reduce U.S. dependence on foreign supply.

By the end of 1981, Anschutz Mining Corporation will have expended approximately $30 million on land acquisition, exploration drilling, verification of reserves, mine rehabilitation and development, metallurgical process piloting and refinery design. The Madison Project will produce superalloy grade cobalt metal, reducing U.S. dependence on foreign imports by 30 percent.

Furthermore, the Anschutz refinery will provide a place for other existing lead mines in Missouri which either produce or can produce a copper-cobalt concentrate to recover a valuable cobalt resource which is presently lost in the copper smelting process. From these lead mine sources, there is a potential for 1,000,000 to 1,500,000 pounds of cobalt per year for at least 10 years. With the additional sources, the Madison Project has the high probability of reducing U.S. dependence on foreign imports of cobalt by approximately 50 to 60 percent for superalloy applications.

THE ANSCHUTZ DILEMMA

The dilemma facing Anschutz today is a classic example of the investment risks facing a U.S. mining company in trying to develop a domestic source of a strategic metal in the face of low-cost foreign competition. About $150,000,000 more must be invested in facilities to complete the project. The low production costs and by-product nature, and past exhibited operating philosophies of Zaire and Zambia inject the sizable risk of at least temporary, predatory price erosions if the Madison Project comes on stream. This market risk (and political risk) necessitates Government support to make the Madison Project feasible for investment by private industry. Put simply, the risks of completing this project have now become too great to be undertaken solely by private industry.

ANSCHUTZ PROPOSAL

The Anschutz Mining Corporation proposes to negotiate a guaranteed price contract under which the Department of Defense (DOD) or the Federal Emergency Management Agency (FEMA) would contract to accept delivery of an average of 2.0 million pound of domestically produced cobalt per year for ten years (1985 through 1994). However, this commitment to accept delivery of 20 million pounds of cobalt shall provide DOD or FEMA the right to refuse delivery and to pay Anschutz an amount (if any) by which the guaranteed price exceeds the market price as determined by the cobalt sale to consumers. Accordingly, the Government would have to make payment only when the current market price is lower than the guaranteed price. This contract would be authorized by, and monies or obligational authority appropriated to DOD or FEMA under Title III of the Defense Production Act of 1950 (DPA).

If the Government decided to accept delivery for storage or use, the receiving Federal agency would pay the then market price. If the market price is lower than the guaranteed price, DOD or FEMA under Title III monies would be committed to pay to Anschutz the amount (if any) by which the guaranteed price exceeds the then prevailing market price for cobalt delivered.

The guaranteed price would be based on estimated operating costs and estimated operating revenues calculated to produce an adequate rate of return. The contract would include appropriate provision for escalation.

Under this proposal, Anschutz assumes the process, construction and completion risks and shares a portion of the market downside risks. Facilities loans would be obtained by Anschutz from private banking sources without a Government guarantee of the loan. It should be emphasized that if for any reason Anschutz doesn't produce and deliver the cobalt, the Government owes nothing.

The Government's maximum potential liability under Title III of DPA, spread out over ten years, would be limited by contract to a total dollar amount to be negotiated with the Government. In other words, the total maximum budget authority necessary during the ten year duration of the contract would be the amount thus negotiated. Realistically, the budget outlays would be expected to turn out to be much less (possibly zero), and not beginning at least until late in calendar year 1985 because of two factors: (1) the excess of the guaranteed price over the market price (if any excess at all) might very likely be well below current estimates in any event; and (2) there is the potential for disruption of foreign cobalt supply (rapidly raising the price in the U.S.). Price rises -- whether resulting from disruption of foreign sources of supply or otherwise -- would have the effect of reducing the Government's potential liability. Details would, of course, be subject to negotiation of appropriate terms.

It is emphasized that under the Anschutz proposal no cash outlay by the Government would be necessary at least until late in calendar year 1984 when the first cobalt would be ready to be delivered and no cash outlay by the Government may ever be required.

What is needed now is legislative authorization to made a commitment for fiscal year 1982 using Section 303 of the Defense Production Act to cover the future price differential contingency. This will allow project development to continue at a quick pace and will assure substantially earlier delivery of cobalt. We ask for timely consideration and a decision on this proposal so that this project may continue.

TESTIMONY OF WILLIAM HOSKEN, PRESIDENT OF THE CALIFORNIA NICKEL CORPORATION, ON OCTOBER 25, 1981

Mr. Chairman and Members of the Committee:

On behalf of the California Nickel Corporation ("CNC"), I appreciate the opportunity to present information to the Committee with respect to the need for government purchase contracts for cobalt through the authority of the Defense Production Act. These contingent purchase contracts would materially assist domestic development of strategic alloying metals vital to the defense and commerce of the nation.

Secure and adequate supplies of cobalt, chromium and nickel -- the three chief metals to be produced by California Nickel -- are essential to the economy of the United States and to its military strength. These alloying metals provide high performance characteristics and are vital in the production of jet aircraft, aerospace vehicles, nuclear reactors, syn-fuel plants, oil well and mine drilling bits, machine tool cutting tips, stainless steel, and ball and roller bearings. Substitutes are not generally feasible, and they involve a performance and/or cost penalty.

As the committee is aware, the United States is highly import-dependent for all three metals. Neither primary cobalt nor chromium is produced in the United States; most of our requirements are imported from Zaire, South Africa, Zimbabwe, and Zambia. All of these countries are either politically unstable or potentially unrealiable sources of supply of such metals. Regarding the third metal--nickel--the United States produces small amounts but most is imported, primarily from Canada.

Within the United States there are only three potentially feasible sources of cobalt large enough to make a major contribution to domestic supply. They are the Blackbird Mine in Idaho, the Anschutz mine in Missouri, and the California Nickel Project near Gasquet, California.

The proposed Gasquet Mountain Mine of the California Nickel Corporation will produce significant quantities of the three strategic metals. Although not presently planned, the mine could also produce manganese. The project's importance to the United States is established by the fact that it, alone, could produce as much as the following percentages of our present military requirements for the metals: cobalt 80 percent, chromium 50 percent, and nickel 35 percent.

As stated, cobalt is vital to aerospace, petroleum, metals fabrication and electronics industries and in military applications. It is a major constituent in superalloys and used in aircraft and aerospace vehicles. Cobalt is essential in the manufacturing of petroleum and mining bits and tools and is a binding agent for cementing carbide chips in tools which are used to machine hard metals. Cobalt is also an essential constituent of high-performance permanent magnets used in lightweight electric motors for aircraft and vehicles and in critical communications and high fidelity equipment.

Chromium, like cobalt, is not produced in this country. Chromium resources are concentrated in two nations: South Africa and Zimbabwe. They alone are estimated to have more than 98 percent of the world's known resources. The United States imports nearly all of its chromium from those two countries and from the Philippines, the USSR and Turkey.

The only known domestic mine producer of chromium scheduled to open within the next 5 to 10 years is California Nickel Corporation's Gasquet Mountain.

Chromium is an essential component of equipment used in almost all sectors of the transportation, manufacturing and energy industries. Chromium-containing steel alloys are used in nearly all roller and ball bearings, without which the wheels of transportation and industry would literally grind to a halt. In its largest use as an alloy agent in stainless steel, substitute materials can be used to a limited extent. However, in non-stainless steel alloy uses, chromium is essential and is largely irreplaceable. Moreover, chromium is irreplaceable in the high-temperature-resisting superalloys required for all jet engines and other gas turbines, for aerospace vehicles and in petroleum cracking.

The United States has only one nickel mine in operation, the Hanna Mining Company's mine at Riddle, Oregon, which was opened in response to the needs of the Korean War. Like chromium, nickel is an alloying agent which is used extensively by nearly all manufacturing sectors of the United States economy. Most of the nickel is used in the manfuacturing sectors of the United States economy. Most of the nickel is used in the manufacture of stainless steel which, as a construction material, provides corrosion resistance in oil refineries and in nuclear, chemical and synthetic fuel plants. Nickel used in superalloys are essential in the manufacture of gas turbines. Nickel-copper alloys are essential in marine applications because of their high strength and resistance to corrosion. Some alloys contain as much as 65 percent nickel, by weight.

The California Nickel Corporation has spent the last four years developing the information essential for establishing a mine and processing plant for a cobalt, nickel and chromium ore reserve located on Gasquet Mountain in the Six Rivers National Forest.

During the last four years the Company has spent several million dollars in performing environmental studies and doing on-site and off-site investigations to determine the optimum methods for mining and processing the laterite ore body on Gasquet Mountain. These feasibility studies and environmental reports have concentrated on finding the best approach to recovering the metals from the ore body and doing so in an environmentally sound manner.

The Company has worked with local, state and federal agencies in developing an operational mine plan that will meet the environmental laws and regulations set forth under the National Environmental Protection Act, the California Environmental Quality Act, the Federal and State Clean Air Acts, the Federal and State Clean Water Acts, and the California Surface Mining Reclamation Act.

Specifically, CNC has for the past three years held meetings with the local, state and federal officials as well as local business and environmental groups to determine the optimum method of bringing these important metals to market while still preserving the environment of the area. This commitment continues as the Company completes its final feasibility studies and environmental impact reports.

CNC plans to submit its final environmental report in April 1982 and hopes to obtain its permits by late summer of 1982. This would permit construction to begin in the spring of 1983 with completion near year-end 1984. Indications are the ore reserve will support a 4000 ton-a-day processing plant for a minimum of 15 years. Such a plant should produce, in addition to the nickel and cobalt, 50,000 tons of chromite concentrate, 4000 tons of manganese oxide and 100,000 tons of magnesium oxide annually. If the project proceeds as expected, it will employ 400 full-time workers with an annual payroll of

$9 million. At the present time, unemployment in Del Norte County, the project area, is approximately 20%. The Company could begin production as early as 1985; however, before it is able to do so, it must assure its investors that the $250,000,000 needed to construct the facility can be justified. CNC is aware that the price of cobalt has been erratic over the past several years, especially since 1978, and given the vulnerability of mining operations at their outset, there is a great risk that this project would be subject to cartel pricing, which could jeopardize the financial stability of the project.

The viability of the California Nickel Project is dependent on not one, but the three chief metals being recovered. It is important to note that across-the-board government supports, through properly formulated DPA contracts for cobalt, chromium and nickel as well as other essential metals, would lessen the likelihood that the government would ever have to purchase these metals. This has been shown during the Korean War, when the techniques of government floor pricing, purchase, subsidy or financial advances were extensively used to develop United States mining capacity in copper, iron ore, lead, zinc, manganese, nickel, magnesium, titanium and cobalt. By using these contracting techniques, the government was able to generate a secure source of these metals at a cost of less than 1% of the gross cost of the projects. It would appear less likely that a cobalt-producing cartel including Zaire would be able to affect a mining operation such as California Nickel if it were aware of the fact that the other metals being produced at the mine were also being supported by the government. This would also be true for the cartels affecting the price of chromium and other metals and would therefore give incentive to producers in the United States to take advantage of all of the metals they discover and recover everything possible. California Nickel Corporation intends to produce cobalt, nickel and chromium from the ore body, and believes that this Committee should review the entire list of strategic metals in order that a comprehensive plan may be initiated by the government.

Narrowing the focus to cobalt, however, would be of great benefit at the present time and would be a great step to the development of the California Nickel Corporation's mining operation. At the present time, the Company believes that a form of purchase contracts for cobalt in the range of $ 20 per pound would meet the stabilization of risk required to finance the project. CNC urges the Committee to seriously consider the use of a form of purchase contract by the federal government as a means of guaranteeing that mines such as CNC;s can be developed absent influences and competition from cartels controlled by foreign governments. CNC believes that the Committee is doing an excellent job in reviewing this difficult area and it would urge that the strategic metals of chromium and nickel be added to the list for consideration.

Mr. Chairman, the crucial importance of recovering the metals is clear, the technology is available and the environmental concerns will be met. I therefore urge this Committee to recommend the use of some form of government contracts in order to ensure that these metals are recovered without interference from potentially hostile foreign nations and government-supported cartels formed for the purpose of perpetuating themselves.

I want to thank the Committee for the opportunity to present this information and will, at your request, provide whatever additional information you desire.

Senator **Schmitt**. Gentlemen, can both of these properties provide cobalt of a quality that is competitive with the Zairian cobalt?

Mr. **Fiorini**. I will answer first. At least in the case of Blackbird, we have been doing a considerable amount of research actually at Noranda involving the process that we plan to use. We have actually produced cathodes through the laboratory there, on a fairly small scale, but all of the indications are that we will be able to produce a very high alloy that is required by the aircraft industry.

Mr. **Melbye**. In our case, we have actually piloted all of the processes, up to producing a pure cathode cobalt of the same purity as Zaire. We piloted each phase of the process and we have the final numbers and the design criteria now to actually build this plant.

ORE RESERVES

Senator **Schmitt**. Mr. Fiorini, the Blackbird reserves are essentially open ended. As far as I can tell, you really don't know what the total reserves may be there. What do you have—what ore reserves do you have outlined right now, assuming a favorable price?

Mr. **Fiorini**. We are actually at—in the process of redoing our reserve picture right now, but we do publish and lay claim to approximately 5 million tons, which is going to be increasing here very dramatically by the end of this year. There are new reserves that are being turned over by our exploration people to us. That 5 million tons represents a reserve base of over 75 million pounds of cobalt contained. Because of the nature of the deposit, being a vein-type deposit, we feel that indications are that the ultimate result will be many times that, and our geologists are very confident.

Senator **Schmitt**. So it is at least 10 years' production beyond that, actually?

Mr. **Fiorini**. Yes. We have right now, based upon our present study, at least 15 years' reserves and we think there is many, many times that.

Senator **Schmitt**. And Mr. Melbye, you indicated 10 years' known reserves at this time?

Mr. **Melbye**. Yes; we have 10 years' of proven reserves. We are also drilling and exploring, and we expect to have an additional 10 years' of proven reserves. We found one new ore body and we have just gotten some molds into another zone, that there appears to be another ore body.

Senator **Schmitt**. Are these fairly classic, Mississippi Valley type deposits?

Mr. **Melbye**. Yes. They occur the same as the lead deposits of the southeast Missouri lead belt, the same occurrence. And we have about 45,000 acres under lease and we are drilling with, I think, six drills running all the time to find new reserves.

Senator **Schmitt**. Are you using geophysical techniques to spot the anomalies?

Mr. **Melbye**. Unfortunately, geophysics doesn't work over there.

Senator **Schmitt**. I thought they had worked out a technique some years ago.

Mr. MELBYE. No, they haven't. We have not found a method; I wish we had. We have tried a lot of methods.

Senator SCHMITT. Induced potential, you've tried them all?

Mr. MELBYE. That doesn't work at all.

Senator SCHMITT. It is too disseminated within the pipe itself, I guess.

Mr. MELBYE. It's very hard to find these things with geophysics. You just have to use good geology and then drill a lot of holes.

Senator SCHMITT. The deposit at the Blackbird Mine, as I understand it, there is some controversy of whether it is stratiformed deposit, metamorphical hydrothermal deposit controlled by stratigraphy; is that right?

Mr. FIORINI. That's right, and that's the latest interpretation that I've heard from our geologist and we have had a talk about this not very long ago. But I believe we may actually have both types occurring there.

Senator SCHMITT. Well, that is probably the reason we geologists have had such a hard time making up our mind in the past, is that with a little bit of metamorphism, you end up with both types.

Mr. FIORINI. Exactly.

Senator SCHMITT. Now, if there were title III authorities granted to you all for 10 years and then not renewed, what would be the impact on the mines? Have you evaluated that, Mr. Melbye?

COMPETITION AFTER 10 YEARS

Mr. MELBYE. Yes. We feel if we had title III assistance for 10 years, by that time the investment would be paid off and our operating cost would be such that we could compete in the world market after 10 years.

Senator SCHMITT. Mr. Fiorini.

Mr. FIORINI. Yes. We actually have the same feeling, that the conditions have changed substantially since the Blackbird Mine was operated originally, and we feel that given the market for cobalt today and what we can see happening in Zaire and Zambia and other places with their cost as well, that this certainly is a world class deposit of cobalt and should be able to compete effectively once the plant is amortized.

Senator SCHMITT. Even if our State Department continues to advocate Eximbank and International Monetary Fund support for the low-cost production in Zaire?

Mr. FIORINI. Yes. Well, actually, I for one believe that we do have to protect our environment, we have a price to pay, and so forth.

But a good example: At Blackbird we have been involved in an environmental impact statement there for 2 years, and if you look at the locked-in capital that we have up there that has cost us several million dollars. We also have to provide our own infrastructure of roads, power, and so forth. And we are not eligible, of course, for the low-cost loans and what have you that they can give to Zaire.

Senator SCHMITT. Have you applied for IMF loans? [Laughter.]

Mr. **Fiorini**. We have been approached on an unofficial basis by the Japanese to finance the project up there, and we were wondering. We may be able to qualify for a loan; I don't know.

Senator **Schmitt**. Gentleman, I appreciate your information and your assistance in this project, and we will continue our exploration of the DPA legislatively as well as looking at what new legislative authorities or activities might be required in order to stimulate production, domestic production of strategic materials.

The hearing is recessed.

[Whereupon, at 12:15 p.m., the hearing was adjourned.]

[Additional material received for the record follows:]

U.S. SENATE,
Washington, D.C., October 29, 1981.

Mr. CHARLES E. MELBYE,
President, Anschutz Mining Corp.,
Denver, Colo.

DEAR MR. MELBYE: Again I would like to thank you for your participation in the Senate Banking Committee hearing on the Defense Production Act and cobalt held on October 26. Your testimony has been very helpful to this Committee as we begin to form conclusions on how best we may resolve this nation's dependence on foreign imports of strategic materials.

I mentioned in the hearing that there would be additional questions for the record. We would appreciate a prompt response to the questions that are enclosed so that we may close the record and submit it for publication.

Sincerely,

HARRISON SCHMITT.

Questions for Anschutz:

1. The U.S. recently purchased 5.2 million pounds of cobalt from Zaire at $15 a pound. The quality was of very high grade estimated at 99.65% purity. Zaire also has a proven reserve base of 70 million pounds of cobalt. Could Noranda, Anschutz, or any other domestic producer provide the quality of cobalt that Zaire is now producing?
2. How long could you continue to produce cobalt; what are the reserves for your project?
3. How long would it take for you to begin production?

THE ANSCHUTZ MINING CORP.,
Denver, Colo., November 12, 1981.

Hon. HARRISON SCHMITT,
Senate Committee on Banking, Housing, and Urban Affairs,
U.S. Senate,
Washington, D.C.

DEAR SENATOR SCHMITT: Thank you for your letter of appreciation on my testimony before your committee. It was a pleasure to have the opportunity to explain our Madison project and how it could make a real contribution to our strategic metal needs.

The following are answers to your three questions:

1. Anschutz can produce the same quality of cobalt now being produced by Zaire. We have actually carried out each step of the processing on a pilot plant scale, which includes concentration, roasting, leaching, solvent extraction, and electrowinning to produce cathode cobalt. We have the engineering data to actually design and build the plant.
2. Anschutz has proven reserves to produce 2 million pounds of cobalt per year for 10 years. With exploration in progress on 45,000 acres of nearby favorable land, geologically, we are obtaining promising results and we expect to find an additional reserve containing 20 million pounds of cobalt, thereby giving a total life of 20 years. In addition, an Anschutz refinery at Fredericktown could process the cobalt-copper concentrates from other lead mines in the area, the cobalt from which is now being wasted in copper smelting, and provide another 1 to 1.5 million pounds of cobalt per year for about 10 years. Missiouri could, therefore, supply a total of at least 30-35 million pounds of cobalt.

3. If we commenced engineering design by the 1st of 1982 and expedited the project, we could be producing cobalt by the end of 1984.

I trust this will answer your questions satisfactorily.

Sincerely yours,

CHARLES E. MELBYE, *President.*

AMERICAN
MINING
CONGRESS
FOUNDED 1897
SUITE 300
1920 N STREET NW
WASHINGTON
DC 20036
202/861•2800
TWX 710•822•0126
J. ALLEN OVERTON JR.
PRESIDENT

Statement by

SIMON D. STRAUSS

CHAIRMAN
MINERALS AVAILABILITY COMMITTEE
AMERICAN MINING CONGRESS

I am Simon D. Strauss, Chairman of the Committee on Minerals Availability of the American Mining Congress. I am also Consultant to and retired Vice Chairman of Asarco Incorporated, a major producer of minerals and non-ferrous metals. During World War II I served as Vice President and Director of Metals Reserve Company, a government corporation created to secure minerals and metals for the war effort. During the Korean War I was a consultant for the Defense Materials Procurement Administration, which played a similar role in supplying metals and minerals for the military. Thus, even though Asarco itself is not a factor in the cobalt industry, I have a broad familiarity with the essential character of cobalt in the nation's defense posture.

Currently, more than three quarters of world production of cobalt outside the Sino-Soviet bloc is obtained from two recently independent nations in Africa -- Zaire and Zambia. Cobalt occurs as a by-product in the operation of the Zairean and Zambian copper mines. As is well known Zaire was invaded in 1978 by a group of insurgents who crossed the border from Angola and seized the copper-cobalt mining areas. They were eventually driven out but political instability continues. Recent press articles indicate that in Zambia the regime of President Kaunda is also under pressure from dissidents.

In both Zaire and Zambia the dominant black governments are having difficulty in attracting expatriate white technicians to operate and manage the mines. Mechanical breakdowns are becoming increasingly frequent due to inadequate maintenance and repair work. Transport difficulties are numerous with resultant delays in outbound shipments of production and inbound shipments of essential fuel and other supplies. As a consequence production has suffered. For the time being, the drop in output is more pronounced with respect to copper than to cobalt, since efforts have been made to maximize cobalt output in view of the relatively attractive price as compared with the depressed price of copper.

Nevertheless, those concerned with national security naturally feel insecure over dependence on supplies emanating from such a distant source. The presence of leftist-leaning governments in the neighboring countries of Angola and Mozambique, including the well-advertised existence of contingents of Cuban trooops, obviously adds to these concerns.

The relatively small production of cobalt in other countries outside the Sino-Soviet bloc is chiefly derived from nickel ores in Canada, Australia, the Philippines, Finland and New Caledonia. The high price of cobalt that developed following the invasion of Zaire in 1978 has tended to increase this by-product recovery -- but it is unlikely to achieve levels comparable with the output in central Africa.

In the United States, mine production of cobalt ceased by 1971 because the small operations in Idaho, Missouri, and Pennsylvania were unable to compete in world markets at prices then prevailing. The only United States domestic supplies currently produced are from recycling of salvaged cobalt-bearing scrap. This accounts for only 2 to 3% of requirements.

The price of cobalt for many years was relatively stable at levels that, in retrospect, appear low. Although the price had been $2.60 a pound for several years in the mid-'50s, it dropped to $1.50 a pound in the early '60s and remained below $2 a pound for the balance of that decade. This was the basic cause for the closing of domestic mines. With inflation world-wide, cobalt prices experienced a gradual rise. The average price of cobalt in 1974 was $3.46 a pound. In the spring of 1978 when the invasion of Zaire occurred, the quotation was $6.40 a pound.

Fears about a prolonged supply interruption brought about a dramatic change. The posted price for Zairean and Zambian cobalt was increased to $20 a pound during 1978, while in the outside market quotations of over $40 a pound were reported on the part of merchants offering small quantities. Consumers were allocated only 70% of previous purchase levels by the sales agent for Zaire.

In 1979 the price advanced to $25 a pound and continued at that level through 1980.

However, high prices had the effect both of stimulating substitution of other materials in some applications and of encouraging increased production through improved recoveries and additions to existing plants.

Once fears about supply interruptions subsided, buying demand slacked off and producers' inventories mounted. The allocations imposed on customers for Zairean cobalt were lifted in July, 1980. Merchant sellers in the outside market dropped their offering price below the producer price of $25 a pound. Early in 1981, the producer quotation was reduced to $20 a pound. Following a stockpile sale, to which reference is made later, the producer price again dropped to $15 a pound and merchant metal is available at still lower prices.

The erratic policies of the strategic stockpile in regard to cobalt -- as for most materials -- have contributed to the problem. When the stockpile holdings were first publicly disclosed in 1963, the quantity of cobalt on hand was about 100,000,000 pounds -- equal to a five-year supply at the average rate of peacetime consumption. However, the stockpile objective was progressively lowered with the target in 1973 being reduced as low as 11,945,000 pounds. Since material in excess of the stockpile goal was classed as surplus, Congress in 1964 and again in 1970 authorized the General Services Administration to make sales. Beginning in 1964 and continuing through 1975 such sales aggregated about 60,000,000 pounds (roughly equal to one year's world production).

Sales were made at prices prevailing at the time of sale. Average realization was less than $2.50 a pound. By 1976 the quantity held in the stockpile had been reduced to 40,802,943 pounds. Then occurred one of the frequent reversals of stockpile policy. A new appraisal, made by the Ford Administration in 1976 at the strong urging of the Congressional Armed Services Committees, established a new goal of 85,415,000 pounds.

Thus the previous surplus was converted overnight into a deficiency of more than 50%. However, no funds were made available in 1976 and 1977 to buy stockpile materials. When the Zairean invasion occurred and cobalt was placed on allocation, consumers clamored for new stockpile releases. The stockpile -- which had been a ready seller at $2 and $3 a pound -- was now a potential buyer and no sales were made.

Early in 1981, after Congress authorized expenditure of $100,000,000 for stockpile purchases, the stockpile re-entered the market. The first purchase it made was 5,200,000 pounds of cobalt from Zaire at a negotiated price of $15 a pound (then $5 below the posted price). Thus $78,000,000 of the first authorization was used for this one metal -- at a price more than six times the average price realized on earlier stockpile sales.

Why is cobalt so important in the military effort? The single most significant use is its role as a high-temperature-resistant alloy component in jet engines. The amount varies depending on the size of the engine, but 450 pounds of cobalt is considered a representative average. No satisfactory substitutes have been developed for cobalt in carbides -- widely used in cutting tools and drill bits. Permanent magnets, catalysts, and medical applications in the radioactive treatment for cancer are other significant uses.

The two basic facts about cobalt have been valid throughout the entire World War II period -- first that its production is concentrated in a distant and politically unstable area; second that its consumption, although not large in tonnage, encompasses some extremely critical applications. The constant shifting of stockpile objectives and the lack of government encouragement to promoting domestic supplies are difficult to understand in the face of these basic facts.

At present large and well-positioned mining enterprises are exploring the country's cobalt potential both in Idaho and in

Missouri. Millions of dollars have been spent in exploration and development work during the last three years to delineate the tonnage and grade of these deposits. The Idaho deposit has some copper and gold in addition to cobalt; the Missouri deposit has nickel, copper and lead in addition to cobalt. In both instances, however, the projects must depend on cobalt for the bulk of their revenues.

During the Korean War the government made substantial contracts involving floor-price guarantees that led to major expansion of the production of aluminum, copper, iron ore, tungsten, nickel and other metals. As indicated in the pamphlet issued by the American Mining Congress earlier this year, which is submitted herewith and made part of this record, only a fraction of the dollar commitments made was actually expended. During the Vietnam War, a major new copper-molybdenum producer was established in Arizona under a DPA contract involving both a loan and repayment in kind with copper at an agreed price.

The companies involved in the cobalt projects believe that there is a potential to produce perhaps 6,000,000 to 8,000,000 pounds of cobalt annually. This is 30 to 40% of normal peacetime demand. However, large investments will be required and because of the lead time required to equip the deposits production will not begin for several years.

Given the erratic history of the cobalt price in recent years, the companies hesitate to make the needed investments without some assurance of a market. This is where Title III commitments under the Defense Production Act could come in.

It would not be appropriate for a trade association such as the American Mining Congress to suggest the basis for such commitments. That problem must be handled through direct negotiation between the Federal Emergency Management Administration or the General Services Administration representing the government and the companies.

However, it is appropriate to point out that to the extent domestic production is created, the stockpile goal can be adjusted downward. Even with the recent purchase, the stockpile will still be 40,000,000 pounds short of its goal -- that would be $600,000,000 on the basis of the price paid in the recent acquisition. Moreover if purchases are made outside the United States, foreign exchange and employment flow elsewhere.

In 1970 and again in 1980 the Congress affirmed through legislation its belief that government policy would be well served through encouragement of a strong and stable domestic mining industry to lessen the nation's dangerous and costly dependence on imported materials. The cobalt situation appears to offer an opportunity -- if Title III of the DPA can be applied -- to make progress toward that objective.

We are grateful for this opportunity to present our views to the Committee and will be pleased to provide such further data as may seem desirable.

AMAX NICKEL, INC.

October 26, 1981

The Honorable Jake Garn
Chairman
Committee on Banking Housing
and Urban Affairs
U.S. Senate
Washington, D.C. 20510

Dear Sir:

AMAX Nickel Inc., a U.S. corporation, has learned that the Committee is taking testimony on the use of the authority granted under Title III of the Defense Production Act of 1950, as amended, to stimulate domestic cobalt production. We would appreciate the opportunity to present our views on this important and timely topic.

AMAX Nickel is the sole refiner of cobalt in the United States today. We currently produce about one million pounds of cobalt per year as a by-product of our nickel and copper refining operations. (The production rate for nickel is eighty million pounds per year, and that for copper is forty five million pounds). Our worldwide marketing and sales force has continually provided us with data on the supply and demand for cobalt, and thus we are acutely aware of the current state of the cobalt market and the vulnerability of the United States to an interruption of supply. AMAX is also aware that the quality of the cobalt imported into the United States is superior to that which we produce; specifically, the purity of AMAX cobalt is not high enough to make it suitable for critical applications such as the components found in the hotest section of gas turbine engines. AMAX, through its interest in a wide variety of raw materials, and its ability to draw on the expertise of its several research organizations has formulated a plan to overcome both of these limitations, a plan that we have submitted for review and possible funding under the aforesaid provisions of the Defense Production Act.

Our proposal, a copy of which is attached, suggests three projects that we feel address the problem of supplying at least a portion of United States requirements for high quality cobalt metal.

A SUBSIDIARY OF AMAX INC. • 599 WEST PUTNAM AVENUE • GREENWICH, CONNECTICUT 06830 • TELEPHONE (203) 622-3500

1. Upgrade the AMAX Nickel facility at Port Nickel, La. to produce a solid cobalt product meeting the stringent requirements of the National Defense Stockpile of Strategic and Critical Materials.
2. Expand our capacity for the production of cobalt to reduce stockpile requirements.
3. Identity sources of above-ground raw materials, i.e. ores, residues, etc. containing cobalt that are a by-product of other mining operations, and develop the means for processing them, so that they could serve as a feedstock for our expanded cobalt plant.

AMAX, under its own sponsorship has been investigating techniques for accomplishing the first task, though some work remains to be completed. Our engineering staff assures us that if the technology of the first project is successful, the second task will also be accomplished -- it is only a matter of engineering, not high risk research and development. The identification of possible raw materials is an ongoing project in our Division; continuing work with our exploration staff, the AMAX Lead and Zinc Division, and the U.S. Bureau of Mines. Certainly one of the most interesting sources of cobalt is that which is available from the Missouri lead and zinc belt. Our own mine processes one million pounds of cobalt each year, but currently only 50,000 pounds is technically and economically feasible to recover. The Bureau of Mines estimates that a total of 2.5 million pounds of cobalt are lost annually from the whole of this rich belt of mineralization. Similar mineralization is known to exist in Mexico, however, the extent of available cobalt resources is not known.

At this time, we in the minerals industry are confronted with a paradox of oversupply. The present state of the world economy has lowered demand, while the two largest and dominant producers in Africa are maintaining a high level of production because of requirements for foreign exchange. This combination has resulted in tumbling prices. Simultaneously, the consuming industries are proposing substitutions or replacements for cobalt because of its "high" price and the uncertainty of long term supply. The net result of these various influences and attitudes is a state of confusion and feeling by a producer like AMAX that any investment in cobalt is subject to a low return and an unacceptably high risk. The management of AMAX Nickel has concluded that one means for reducing this risk is to seek support from an outside organization such as the Federal Emergency Management Agency. Their efforts, through a modest investment in a project like that outlined herein, would go a long way toward concurrently decreasing both the risk and the vulnerability of our defense-related industries to a disruption of supply.

We firmly believe that our proposals offer a practicable approach to reducing our dependence on foreign sources of cobalt. Further, the funds required for improving and upgrading existing facilities are bound to be less than for a greenfield installation.

AMAX Nickel appreciates having the opportunity to express its support for the efforts of FEMA and to outline how we might interact with them.

Thank you for your attention.

Yours truly,

R. Genssler
President

RG:blc

AMAX NICKEL, INC.

September 9, 1981

Mr. Paul Krueger
Assistant Associate Director
FEMA
Washington, D.C. 20472

Dear Paul:

The strategic importance of cobalt has been the subject of lengthy debate generating much heat, but little light for those in decision making positions. Few would argue the technical necessity of high temperature alloys containing cobalt, or magnets or catalysts based on cobalt, nor would one argue the dependence of United States Industry on foreign sources of this important metal. The debate rages on the quantity of cobalt to be stockpiled in case of interruptions of overseas deliveries. AMAX Nickel is in a position to ameliorate the adverse effects of such an interruption because of two important factors--we own and operate the only domestic refinery capable of producing metallic cobalt and, as a part of a much larger organization with expertise in the refractory metals Mo and W, the base metals Cu, Pb, and Zn, as well as transition metals of Co and Ni, we can draw on the strong technical capabilities of these divisions and their laboratories to identify sources of cobalt and the means of extracting and refining it from a variety of feed stocks. For example, these laboratories have recently developed technologies that will on the one hand allow us to produce a superior grade of cobalt and, on the other hand, process some by-product cobalt such as the arsenic containing material from our lead-zinc refinery operating in Missouri.

As a result of our interest in cobalt and these new developments, we are writing to outline three suggestions for projects that could be funded under Title III of the Defense Production Act, as amended. We believe that positive action by FEMA on these suggestions will lessen the United States dependence on foreign sources of cobalt. We would hope that these suggestions would serve as a basis for discussions between AMAX and FEMA that would lead to specific proposals for funding. The three project areas are:

A SUBSIDIARY OF AMAX INC · 599 WEST PUTNAM AVENUE · GREENWICH, CONNECTICUT 06830 · TELEPHONE (203) 622-3500

1. Upgrade the AMAX Nickel facility at Port Nickel, La. to produce a solid cobalt product meeting the stringent requirements of the National Defense Stockpile of Strategic and Critical Materials.

2. Expand our capacity for cobalt production to reduce stockpile requirements.

3. Identify sources of raw materials, and develop the means for processing them, so that they could serve as feed stock for our expanded cobalt plant.

The AMAX Nickel refinery at Braithwaite, Louisiana, treats Ni-Cu-Co sulfide mattes by leaching and chemically separating the three metals into their own individual streams. The Ni-Co separation has always been a difficult one to accomplish; at present, nickel produced at our plant contains about 250 ppm cobalt whereas the cobalt product contains about 2000 ppm nickel. Not only has this process been relatively inefficient but it is also expensive. A recent technological breakthrough in solvent extraction in a sulfate medium was made known to AMAX that offers us the opportunity to improve the degree of the Ni-Co separation at a lower cost. Our laboratory in Golden, Colorado has reported that the new extractant has been able to lower the nickel content in the cobalt and vice-versa by an order of magnitude, i.e. to 200 ppm Ni in the cobalt and 25 ppm Co in the nickel. Other impurity elements are removed in separate processing steps. The details of the process are beyond the scope of this communication, but we are confident that the solvent extraction system will yield products with purities that will compare very favorably with electrolytic cathode of both metals.

Although great strides have been made in proving the feasibility of the solvent extraction system, there is development work yet to be done. It has not been decided what process should be used to recover the cobalt from the purified sulfate stream--hydrogen reduction as practiced at our plant today, yielding a powder, or electrowinning a solid cathode. If electrowinning is preferred, because of the form of the product, the "plating" conditions still must be established to ensure maximum purity of the product.

Our evaluation of the combined solvent extraction and electrowinning facility is encouraging; however, AMAX believes that the uncertainties in the marketplace counter balance or even outweigh the anticipated economic benefits. As a consequence, AMAX is unwilling to proceed with the project as had been envisioned earlier this year. However, AMAX does recognize the strategic importance of cobalt and our unique position as a domestic producer. Therefore, AMAX respectfully requests assistance in financing our plant modification that will produce one million pounds of cobalt cathode (plus 80 million pounds of nickel) under the provisions of Title III of the Defense Production Act. We envision two stages of activity. First, some additional development activities, to be conducted at either our Golden or Carteret laboratories, are required before the process is completely defined. The objective of this program will be to establish the interrelationship between the solvent extraction and electrowinning processes as well as to define the optimum conditions of voltage,current density, and electrode spacing to produce the highest quality cathode at a rate compatible with the output of the solvent extraction process. We anticipate that the program will cost about $1,200,000 including $50,000 for equipment in today's dollars. The second stage would be the actual plant modification; our engineering staff has estimated that that project will require about $20 million, $15 million for the solvent extraction system and $5 million for the electrowinning facility, again in today's dollars. We would request that the assistance be in the form of a National Defense Stockpile purchase of $21.2 million worth of cobalt, with payment in advance to finance the process definition study and construction. The sales contract would be fulfilled by AMAX shipping highly refined cobalt cathode to Government warehouses at a rate mutually agreed upon with the values of the quantity shipped to be negotiated, based on market conditions and the recoupment of our costs including capital costs incurred by AMAX. It would be our intention to complete the transaction within a period of 10 years, i.e. to have shipped sufficient value of cobalt to equal the $21.2 million, and accrued interest if any, in 10 years or less. We would argue that there are considerable economies to be realized by supporting an existing plant rather than funding the tremendous capital costs associated with the development of a new mine and plant.

Although we can be rather specific about the upgrading of our existing facility, the other two topics of increasing capacity and identifying potential feed stocks for that increased capacity must be treated on a more conceptual basis, while emphasizing their strong interrelationship. Our understanding of the proposed solvent extraction system is that a certain degree of flexibility in production rates is built in, but the remainder of the plant including matte or ore preparation, leaching, purification steps beyond solvent extraction, and winning of the metal from the solution, must reflect the quantities to be processed as well as the physical and chemical nature of the feed stock. Therefore, AMAX would also like to suggest that a program be initiated that would define other cobalt-containing residues, slimes, spent catalysts, etc. that could be processed by the new solvent extraction procedure. (We could even consider reprocessing some existing stockpiled metal.) An example of the type of study needed is the one successfully completed by the AMAX Lead and Zinc Division to recover cobalt from arsenic containing residues generated by a zinc purification process. Although there is not a great deal of cobalt available from the AMAX plant by this route, about 50,000 pounds per year, the technique is applicable to similar residues from other zinc plants or, for that matter, it is applicate to other arsenic plus cobalt containing materials. AMAX is aware of and also supports the work of the Bureau of Mines at Rolla, Missouri to develop methods for increasing the quantity of cobalt extracted from ores and similar residues. They have estimated that 2.5 million pounds of cobalt are lost annually from the ores mined by the lead-zinc plants in Missouri. Some way must be found to significantly increase the quantity of cobalt that is recovered. The AMAX refinery at Braithwaite would be able to process any or all of the recovered cobalt, even the 2.5 million pounds being lost today, if that should come to pass. There is no need for AMAX to duplicate the efforts of the Rolla facility; however, it will be important for us to keep abreast of their results and to be ready to assist them if the need arises. AMAX would suggest that it would be worthwhile to look beyond the lead-zinc belt in Missouri and identify other domestic sources of cobalt, such as spent catalysts, metal slimes, or other such materials that could be processed to recover metal values. We are in a position to undertake such a task and, furthermore, AMAX would consider proposing a research program to convert these cobalt bearing materials to a stream suitable for the solvent extraction and purification process if that were deemed advisable. The identification of sources of raw materials and the means for processing same will also allow us to design plant modification for increased capacity, say to 5 or 6 million pounds of cobalt per year.

In summary, AMAX has outlined a program for significantly reducing the dependence of United States industry on foreign cobalt, a program that could logically be funded under the provisions of Title III of the Defense Production Act, as amended. The cornerstone of the program is the installation of a combination solvent extraction-electrowinning facility at the AMAX refinery in Braithwaite, Louisiana capable of producing 1 million pounds of highly refined cobalt cathode. The construction of the plant modification would be financed by the purchase of cobalt with an advanced payment to cover costs of the construction of the new equipment. An additional request is included for funds to develop the optimum electrowinning conditions. The AMAX facility will be able to process a wide variety of raw materials, including arsenic-containing cobalt by products or ores, thus a concerted effort by AMAX and the Bureau of Mines should be undertaken to define processes for recovery of cobalt from lead-zinc ores or any other cobalt source. AMAX would be interested in cooperating with FEMA and the Bureau of Mines on this topic.

We firmly believe that the program outlined would result in significantly lower dependence on imported cobalt, a worthwhile objective in these troubled times.

We look forward to having the opportunity of discussing our proposals with you. Your consideration of our approach to solving our mutual concerns is greatly appreciated.

Very truly yours,

Robert G. Dunn
Vice President -
Sales and Marketing

RGD:FLM

TESTIMONY PRESENTED TO THE COMMITTEE ON BANKING,
HOUSING AND URBAN AFFAIRS
December 4, 1981

Mr. Chairman and distinguished members of the Committee, my name is James L. Daniell and I am President of RMI Company, located in Niles, Ohio. We are the leading producer of titanium mill products in the United States. We are pleased to have this opportunity to offer our views on the Defense Production Act, and its effects on the security and well-being of the United States.

Just over 30 years ago the Congress, in its wisdom, passed Public Law 81-774, the Defense Production Act of 1950. This act was designed as a preparedness measure. It authorized the President to institute and maintain a number of programs designed to improve the readiness of the nation's industrial base. The key concept behind the Act was development of a responsive industrial base. Several of the tactics used in the titanium industry could be used again today -- stability and predictability in order patterns. In other word, you tell us what you want and/or need, make the funding available, and stand aside while we rush to do it.

We have the opportunity to sit before you today specifically because the titanium industry was a partial creation of the DPA. In the 1950s, $900-million of DPA funding was made available to assist in our industry's development. Though the growth of the industry has been sporadic, we are reaching a threshhold where our explosive growth is becoming a vital part of America's economic system and defensive security.

Many of the problems of our nation's industrial defense base have been well documented. We are all well aware of the insights provided by investigations into the responsiveness and flexibility of America's defense industry. These include commentary by experts like General Alton Slay, Deputy Secretary of Defense Carlucci, Dr. Morgan of the Bureau of Mines, members of the House and Senate Armed Services Committees, members of this Committee, and others. We wholeheartedly concur with the notion that we are in a poor state of preparedness.

Today, we would like to (1) very briefly outline the history of the titanium industry, (2) give you our forecasts of domestic supply and demand in the 1980s, and (3) suggest how the Defense Production Act could be effectively used to insure the titanium industry's ability to respond quickly and efficiently to any surge in defense requirements.

During the early years of the titanium industry, virtually all production was absorbed by America's defense community. Thus, as worldwide tensions alternately heightened and relaxed, the industry went through cycles of growth and contraction. As a result, several major American companies have been in and out of the business. Only Timet and RMI have been continuously in production since the 1950s.

Until the late 1960s, most domestic industry expansion had been in anticipation of our country's defense needs. Since few of these projects actually materialized, supply has more often than not exceeded demand. This was true until the last three years.

During the 1970s, the titanium industry began to rapidly expand its application into the non-aircraft markets. We have been especially aggressive in chemical processing and energy exploration and production applications.

A combination of increased usage in these strategically important industries -- a surge in both commercial and defense aircraft requirements, and the almost total withdrawal of foreign titanium suppliers to American industry -- created a shortfall in 1979 and 1980. This shortfall demonstrated the fragile nature of our domestic industry. Considering the strategic importance of titanium metal to America's defense posture, we respectfully submit this should not be allowed to happen again. Title III of the Defense Production Act provides us with an active vehicle to provide this insurance.

In the coming decade, we again foresee the possibilities of domestic shortfalls. There are now five integrated producers of titanium sponge and mill products. All have announced capacity increases, or have plans on the drawing boards. If all announced plans come to fruition, there will be about a 40% increase in sponge and mill product capacity by 1985.

With no growth in chemical, energy, or defense applications, this would allow our industry to be totally self-sufficient domestically. But, a no-growth posture is unrealistic. The B-1B program will require massive amounts of titanium in the next five years. As current chemical plants are modernized, large amounts of titanium tubing will be utilized, taking advantage of the metal's resistance to corrosion. In the second half of the decade, the oil and gas industry will take a major portion of the industry's production capacity -- growing from only a few percent today.

The growth of these three extremely important components of America's industry could very well go beyond anticipated capacities. And, we would again be vulnerable to the whims of offshore supply channels.

A couple of years ago, we testified before another Senate Committee on the dangers of dependence on Soviet titanium sponge product. And we were proven right, as they withdrew support of American and European markets so they could build nuclear submarines out of titanium. At the same time, the Japanese shifted their exports to Europe to fill the gap left by the Soviets.

The real needs of the titanium industry, and the goals under which we would suggest actions be taken, are those of stability and predictability. A truly responsive system dealing with defense production requires a number of fundamental capabilities.

(1) the ability to adequately produce both defense and commercial requirements
(2) adequate supplies of materials
(3) a structure which allows for orderly and rapid change-over from commercial to defense production
(4) predictable markets, especially in both peacetime and surge requirements
(5) freedom from heavily cyclic pressures.

The three titles of the Act which remain in force (Titles I, III, and VII) offer a legal structure for providing a responsive system.

As we stated earlier, a number of knowledgeable individuals have presented significant arguments and recommendations for uses of the Defense Production Act. We strongly concur with several of these, and would like to repeat them for emphasis.

(1) Trim down and make current the DPA. Present it in a clear and concise form. The currently active titles (I, III, and VII) should be adequate enough to stimulate action and use by Congress, industry, and agencies of the Executive branch.

(2) When the required revisions are made, extend the Act for five years, so that interested parties have a known charter, with reduced uncertainty. This would be seen by all, especially those of us in industry, as communication of a commitment to making common sense and workable solutions to national problems.

(3) Title III could be updated so as to be specifically supportive of solutions to today's problems. In the titanium industry, this might include proposals to insure domestic supplies of titanium-bearing ores -- rutile and ilmenite. Or, it may encourage further capacity expansions through purchases into the governmental stockpile program. (The titanium stockpile is currently at only 5-6% of target!)

As GAO recently concluded in its report on Shortages and Bottlenecks: "Creation of new capacity is an expensive process ... and a lengthy one, often taking upwards of 5-10 years. As the decision-making environment for business grows more complex and uncertain, both the costs and lead times for investment in capacity are likely to grow."

These problems can be overcome by use of Title III in several specific ways:

(1) Change Section 301 so as to raise the loan guarantee level from the current $38-million to $100-million

(2) Reduce mandatory Armed Services Committee reviews to a maximum of 30 days of continuous session

(3) Recapitalize the borrowing authority which was lost in 1974, so Title III projects do not have to pass through the regular authorization and appropriation processes. A borrowing authority comparable to the $2.1 billion previously authorized (or an amount deemed appropriate by this Committee) might be appropriate.

This being said, we respectfully suggest the time for studying is over. The analysis phase is long behind us, and further analysis would have marginal, if any, utility. Now is the time for action!

This Committee now has the opportunity to take an important and significant leadership role. You have the ability to unify and direct the Departments of Defense and Commerce, and FEMA into a force strong enough to make effective and progressive action possible.

A coordinated effort in this Congress is necessary between yourselves, your counterparts in the House Banking Committee, the Armed Services Committees, and the Appropriations Committees. Your committee could well be the focal point for this coordination.

Any solution to our country's problem must be seen in the proper context. A major, if not the major, concern of this Congress is the problem of how to rebuild our nation's defense capabilities in the most efficient and effective manner.

Currently, our country lacks the strong industrial base required to develop a strong defense capability. Over the next four years, we are projected to spend one trillion dollars for the security of our great country. Is it not reasonable to think the expenditure of only one-tenth of one percent (0.1%) to reactivate, or refinance, the DPA would have a significantly beneficial influence on turning our country around?

We are not advocating massive, immediate expenditures, or an extensive number of programs. However, we do believe it is time to go on record with a commitment to action. We suggest that this may come in the form of borrowing authority, with specific projects to be determined in a timely fashion, as resources permit.

Members of the Committee, the next few years are critical to our nation's security posture. A modified Defense Production Act is a very workable vehicle by which we can reverse the trends of increasing inefficiency and diminished responsiveness. It can give American industry a foundation of stability and the predictability required to meet foreign competition, whether it be economic or military.

American industry stands ready to make their contribution to rebuild America's defenses. For too long, we have all been studying and discussing the problem. We believe the time for action has come. This Committee can play the major leadership role to put forth the necessary legislative framework to rebuild our industrial base. We in the titanium industry are ready to play our part.

UNITED STATES TITANIUM INDUSTRY PERSPECTIVE FOR THE 1980'S

A PRESENTATION TO
UNITED STATES SENATE COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS

December 1981

"During the early years of the titanium industry, virtually all production was absorbed by America's defense community. Thus, as worldwide tensions alternately heightened and relaxed, the industry went through cycles of growth and contraction. As a result, several major American companies have been in and out of the business. Production of titanium sponge involves usage of specialized single-purpose equipment and only RMI and Timet have been in production continuously since the 1950s.

"Until the late 1960s most domestic industry expansion had been in anticipation of our country's defense needs. During this time, growth was stifled by foreign supplies (i.e., Soviet Union) of sponge at prices which were judged by the U.S. Treasury as constituting dumping. Since few of these projects actually materialized, supply has more often than not exceeded demand. This was true until the last 3 years.

"During the 1970s the titanium industry began to rapidly expand its application into the non-aircraft markets. We have been especially aggressive in developing chemical processing, and energy exploration and production applications.

"A combination of increased usage in these strategically important industries—a surge in both commerical and defense aircraft requirements, and the almost total withdrawal of foreign titanium suppliers, particularly the Soviets and Japanese to American industry—created a shortfall in 1979 and 1980. Withdrawal of Soviet titanium sponge from the U.S.A. and Western European markets has been acknowledged to relate to massive U.S.S.R. titanium submarine programs. Additionally, Japan withdrew supplies of titanium sponge to the U.S.A. and redirected the material to the apparently more lucrative European community. Historical evidence has shown that the foreign suppliers . . . Soviets . . . Japanese . . . and People's Republic of China . . . are not hampered by costs of production when selling titanium sponge. In 1968 . . . dumping was proven. During 1979 and 1980 . . . opportunistic pricing of foreign sponge prevailed at three to five times domestic U.S.A. levels. Disruption of the American market ensued. This shortfall demonstrated the fragile nature of our domestic industry. U.S. titanium producers can be competitive with foreign companies provided there is fair and equitable competition (i.e., laws, tax structure, depreciation, etc.). Our American union workers can be productive as demonstrated by the 77 percent productivity improvements at RMI Company. This is contrary to the trend of all American industry. Considering the strategic importance of titanium metal to America's defense posture, we respectfully submit this must not be allowed to happen again. Title 111 of the Defense Production Act furnishes us with an active vehicle to provide this insurance.

"In the coming decade, we foresee numerous possibilities of domestic shortfalls. There are now four integrated producers of titanium sponge and mill products. All have announced capacity increases, to support domestic market needs or have plans on the drawing boards. If all announced plans come to fruition, there will be about a 40 percent increase in sponge and mill product capacity by 1985.

"With no growth in chemical, energy, or defense applications, this would allow our industry to be totally self-sufficient domestically. But, a no-growth posture is unrealistic. The B-1B program, as well as potentially large naval applications, will require massive amounts of titanium in the next 5 years. The industry stands ready to support the B-1B and other areas when funding is approved. As current chemical plants are modernized, large amounts of titanium will be utilized, taking advantage of the metal's resistance to corrosion. In the second half of the decade, the oil and gas industry will consume 15-20 percent of the industry's production capacity—an increase from only a few percent today.

"The growth of these extremely important components of America's industry could very well go beyond anticipated capacities. We would again be vulnerable to the desires of foreign suppliers. Neither the U.S. military establishment nor the commerical sector should be held hostage by unpredictable foreign sources, rather we must create a strong domestic titanium industry which will have as its goals . . . greater stability and predictability."

JAMES L. DANIELL,
President, RMI Company.

The chlorine used in the production of titanium tetrachloride and the sodium used in the production of titanium sponge are produced at the RMI Sodium Plant in Ashtabula, Ohio. Recently, capacity was added to this facility as a part of a multi-million dollar expansion to support RMI's increased production of titanium sponge. Plans have been prepared to support further expansions when warranted.

At the RMI Metals Reduction Plant, titanium tetrachloride is reacted with sodium and reduced, in two steps, to titanium sponge. In June of 1980, the annual capacity of this facility was increased by 27 percent to 19 million pounds at a cost exceeding $4,000,000. Plans have been developed and land is available which will allow incremental expansions up to 31 million pounds annually when warranted by demands of the marketplace.

At the RMI Niles, Ohio plant, the titanium sponge produced in Ashtabula is converted into titanium mill products of all grades and shapes. RMI is currently in the midst of a $50,000,000 Corporate Modernization Program which includes a $20,000,000 expansion of the Melt Shop, and an $8,000,000 forging press facility which will double RMI's forging capacity.

At Niles, Ohio RMI has over 177 contiguous acres of land of which 58 acres or less than one-third are presently used in the production of titanium mill products. There is ample room for expansion to support any foreseen needs of the domestic titanium industry.

These facilities are adjacent to a U.S. Government G.S.A. Stockpile storage area.

TITANIUM

The fourth most plentiful structural metallic element in the earth's crust: 1. Magnesium; 2. Aluminum; 3. Iron; 4. Titanium.

ORES

Rutile; Ilmenite; 95% to Pigment as TiO_2; 5% to Metallic Titanium.

CHARACTERISTICS OF THE METAL

1. Light in Weight;
2. High in Strength;
3. Resistant to Corrosion.

APPLICATIONS OF THE METAL

1. Defense Aircraft and Engines;
2. Commercial Aircraft and Engines;
3. Chemical Processing;
4. Oil and Gas Exploration;
5. Energy Conservation.

U.S. PRODUCERS OF TITANIUM SPONGE [1]

[1982 estimate]

	Annual production capacity, in pounds
RMI—RMI Co., Ashtabula, Ohio	19,000,000
OREMET—Oregon Metallurgical Corp., Albany, Oreg	9,000,000
TIMET—Titanium Metals Corp. of America, Henderson, Nev	30,000,000
D-H CO.—Dow-Howmet Co., Freeport, Tex	2,000,000
ITI—International Titanium, Inc., Moses Lake, Wash	4,000,000

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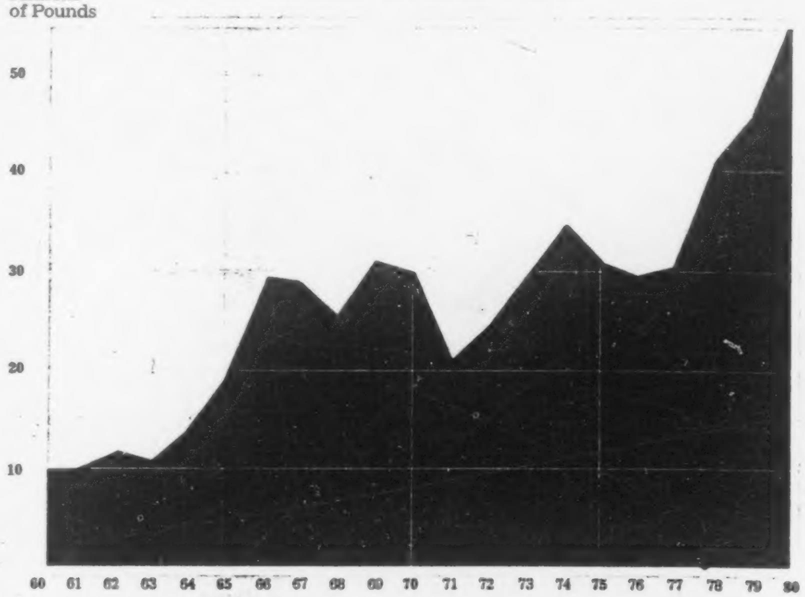
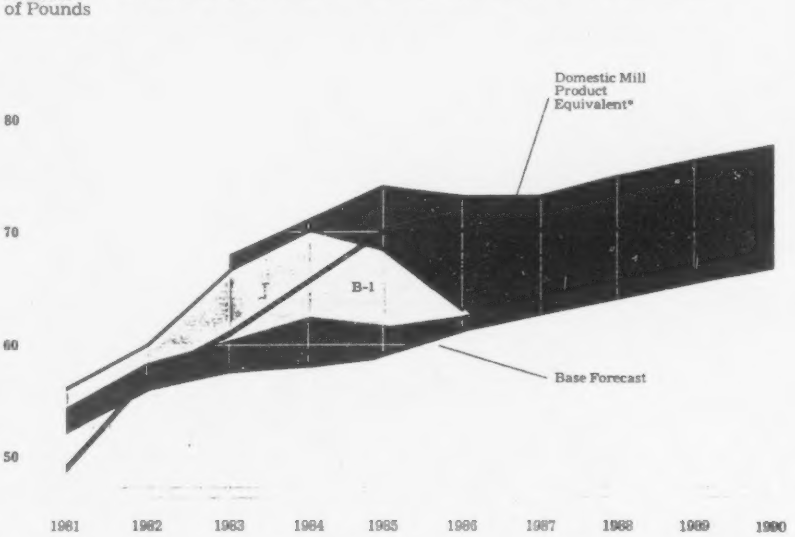
[1] Titanium sponge—the first metallic form of titanium reduced from the ore. Called sponge because of its appearance.

HISTORY OF TITANIUM MILL PRODUCT SHIPMENTS



In the past twenty years, the titanium industry has experienced periods of growth and contraction. Attempts have been made to expand and diversify into markets other than aircraft and engines. Growth in commercial markets helped to provide stability to a historically cyclic industry—an industry essential to our strategic posture.

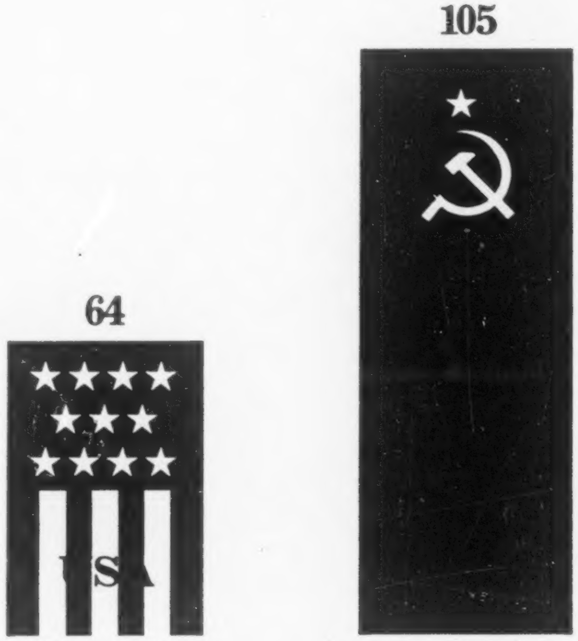
TOTAL DOMESTIC MARKET POTENTIAL



*Domestic Mill Product Equivalent= Total domestic titanium sponge capacity divided by 1.16.

The domestic requirements for titanium mill products in the years ahead will exceed those capable of being produced from domestic titanium sponge. Foreign sponge **or preferably increased production of domestic titanium sponge** will be required to meet the demand.

TITANIUM SPONGE CAPACITY 1982 ESTIMATE MILLIONS OF POUNDS



NOTE

The committee also received additional documents for the record which could not be reprinted at Government expense.

The list of these publications, which are retained in committee files, follows:

"Cobalt Project," prepared by Marily B. Biviano, National Defense Stockpile Policy Division of the Federal Emergency Management Agency.

"Cobalt," by John T. Kummer, from the 1980 Bureau of Mines Minerals Yearbook.

"Cobalt: Effectiveness of Alternative U.S. Policies to Reduce the Costs of a Supply Disruption," Department of the Interior, Office of Minerals Policy and Research Analysis, August 1981.

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